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THE OIL WEEKLY

WORLD OIL

SPECIALIZED FOR EXPLORATION, DRILLING, PRODUCING,
PIPE LINE OPERATIONS AND MANAGEMENT

JULY, 1953

• For a glimpse into oil field camp life . . . turn to the International Section

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See REED insert, pages 17 through 22

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WORLD OIL

Established 1916 as The OIL WEEKLY®

July, 1953 Vol. 137, No. 1

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A Quick Look at This Issue

BUSY OIL MEN: To help you put first things first, scan these time saving digests on this and the following pages, checking [√] those you want to read first.

CURRENT OUTLOOK

☐ **Steel goods should be plentiful** despite end of priorities assistance . . . U. S. Navy to shut down exploration in Alaska as "unsound" . . . Heating oil to continue in sharp demand . . . Puget Sound area promises to become important refining center . . . "cartel" suit is nearer settlement. See *Looking Ahead,* **Page 59.**

☐ **The name's a shame** . . . and so's the idea, says Publisher Ray L. Dudley of the so-called excess profits tax. It might well be termed a tax against future lathes in the factory, against the development of new ideas in commerce, against the safety of our country, he says. And he suggests . . . "if ours is such a present dire emergency as to require the continuation, even for only six months, of such a tax, let us be honest and call this thing by a more accurate name." See the *Publisher's Page,* **Page 61.**

☐ **A fire is a personal insult** to Myron M. Kinley. He'll fight it with dynamite in one hand and a crutch in the other, if necessary. Beginning the fabulous

Turn the Page ➡

A QUICK LOOK . . .

story of a man who labored for years to establish his fire-fighting profession as just another routine specialty vital to the oil industry. **Page 63.**

☐ **Offshore operations are at the mercy of hurricanes . . .** unless pinpoint forecasting is utilized. Unlike shore installations, which must guard mainly against winds in excess of 100 miles an hour, the offshore unit is jeopardized by wind waves, surf conditions, swell, and storm tide. For a description of how Gulf Coast operators and others around the globe guard against the hurricane menace, turn to the concluding installment of *When the Big Winds Blow* on **Page 68.**

☐ **Natural gas supplies** for interstate marketing are being curtailed . . . gas prices are being forced up to the long-range detriment of consumers as well as gas transmission companies and oil and gas producers . . . all by two actual and threatened regulatory policies of the FPC. Details on curtailment of supplies and company limitations, **Page 71.**

☐ **A report on NPC report . . .** of special interest to those studying the possibilities and problems of Continental Shelf oil and gas development in U. S. The National Petroleum Council recently issued the report covering an oil industry study made at the request of the Federal government and in connection with national defense. **Page 79.**

☐ **A pair of shiny, high leather boots** was once the goal of Frank W. Abrams, Chairman of the Board of Standard Oil Company (N.J.). He didn't get to wear the boots, but . . . What happened is another *Big Moment* in the life of an oil industry personality. **Page 79.**

☐ **ARAMCO is the world's largest oil producing company.** The title goes to the company on the basis of its 301,860,885 barrels produced in Saudi Arabia in 1952. Is coal going to take to pipe lines? Mid-East gets a shot in the arm. An API in Europe has been advocated. It's all in *Changing Panorama,* **Page 80.**

☐ **What do crude price increases mean?** Industry now has a chance to improve its economic position. But there's the danger supply may be encouraged to get out of hand. See *Report from the Observatory,* **Page 84.** For the background of price increases, see *News Analysis,* **Page 88.**

EXPLORATION ARTICLES

☐ **The geology is favorable . . .** but it's complex in the Black Warrior Basin. Several gas-condensate and gas fields have been discovered recently in return for the relatively few wildcats drilled. The success has stimulated activity in the area. But a geological understanding is necessary for finding and producing oil and gas that may be present. Stratigraphy and structural conditions are discussed in detail in the conclusion of a two-part article beginning on **Page 97.**

☐ **Precise formation correlations** are important in evaluating a geologic prospect for oil or gas. Mistakes often result in exploration failures. Here are some reasons for these failures and recommendations designed to achieve more accurate subsurface information. **Page 109.**

☐ **Exploratory drilling continues upswing . . .** completed tests in May were second highest in 1953. Year's total holds 7.2 percent lead over 1952's record-breaking operations. And the recent crude price increase is due to give a boost to program that is clipping all records. See the monthly report on exploratory drilling, **Page 116.**

DRILLING ARTICLES

☐ **Oil is getting harder to find.** Many producing zones which otherwise might be passed up are now accessible through directional drilling. Here's an article that tells how to plan and execute a directional drilling job. It is based on the author's many years of experience in south Louisiana, where the technique is being applied with increasing frequency. **Page 129.**

☐ **Make a fire extinguisher** from a used five-gallon propane bottle. That's what a Canadian drilling contractor did. It delivers 60-foot spray from 120-pound air pressure from rig source. It can be used as a portable or stationary unit. Find out how to make it on **Page 134.**

☐ **Cheaper drilling may result** from the Lubinski-Woods findings. The authors cite substantiating field results that cheaper drilling may be attained by carrying heavy weights in crooked hole formations and drilling "straight" but "inclined" holes. Charts will help you ascertain the most economical means of fighting your crooked hole problem. **Page 135.**

A QUICK LOOK . . .

☐ **One rig has hole trouble** while a nearby rig using a similar mud doesn't. Why? An analysis of drilling practice could reveal the reasons. Among the factors affecting drill hole conditions and discussed in the article on **Page 144** are:

- Drill pipe action
- Makeup water
- Tripping with full hole
- Properties of flowing mud.

☐ **The derrickman's job is easier** with an elevator devised by an Humble Oil & Refining Company employe. For an explanation of how the tiresome task of climbing is made faster, simpler and safer, turn to **Page 152.**

☐ **It's Easy to Get Hurt!** It's also easy to keep from getting hurt. For another accident report direct from the files of a company in the drilling industry, see **Page 153.**

☐ **Avoid core barrel trouble . . .** by following the simple rules in the article starting on **Page 156.** Core barrel maintenance is a *must* if a high percentage of core recovery is to be expected. Core barrels improperly assembled . . . dirty . . . damaged . . . will result in no recovery and an occasional fishing job. Avoid these troubles by following a program of inspection and maintenance.

PRODUCTION ARTICLES

☐ **Reduce lifting costs in pumping wells** by keeping the unit operating efficiently. The dynamometer will —in most cases—tell you what's wrong in the pumping system so that only the necessary repairs need be made. Typical curves which illustrate five different pumping troubles are presented in *Interpretation of Dynamometer Cards,* **Page 175.**

☐ **Increase engine efficiency** by vapor phase cooling.

- It reduces cylinder wear
- Increases life of lubricating oil
- Results in more uniform cylinder temperatures
- Minimizes rust and scaling

These are conclusions reached by several years of checking on engine performance after vapor phase cooling systems were installed in an electric generating plant at a remote Wyoming location. How the system works, parts included, and test results are presented on **Page 182.**

☐ **A second crop of oil,** estimated at more than 200 million barrels, is ready for harvesting from the old Healdton field of southern Oklahoma. This vast reserve, equivalent to the discovery of two major fields, can be recovered by efficient water-flooding. *Healdton Has Big Water-Flood Potential* starting on **Page 190** is a study of this field made by U. S. Bureau of Mines engineers in cooperation with the state of Oklahoma and operators in the field.

☐ **Unitization and How It Works** is discussed for the non-legal oil man who is interested in or considering joining a unitization project. The steps in forming a

Turn the Page ➡

Another WORLD OIL extra . . .

. . . the International Operations issue will be coming your way on August 15 . . . and it will be combined this year with the annual Mid-Year Outlook Issue. In previous years the International Operations issue was published on July 15. But beginning this year, these two special issues will be combined to give you a complete roundup of oil and gas industry activities throughout the world, including the U. S., under a single cover.

We feel that by combining these two special issues you will be able to get more use from the material offered by each. For ready reference—for both domestic and foreign readers—the combined issue of August 15 will offer:

- A colored map insert of northern South America.
- Black and white maps of numerous other countries.
- Country-by-country summaries on areas where oil has been found or is being sought.
- Refining, pipe line, production and drilling data.
- Political developments of importance and what they mean to oil companies.
- Numerous pictures showing the development of the oil industry in various countries and how that progress has affected nations in which it has occurred.

. . . watch for it August 15

A QUICK LOOK . . .

unit are simple. The basis for participation are fair. Some find it complicated. For a discussion in easy-to-understand language, turn to **Page 198.**

PIPE LINE ARTICLES

☐ **Save money on electrical equipment.** Here's a list of basic rules for maintaining electrical equipment. It has been worked up over the years by the engineering department of one of the nation's leading manufacturers of electrical equipment. It's a must for anyone operating electrical equipment at pump stations or compressor stations. **Page 221.**

☐ **Map of the Month.** Northern Natural Gas Company, a veteran of 23 years in the gas transmission business, was born in depression days when risk capital was scarce . . . and the idea of transporting natural gas through large diameter pipe lines was considered by some a fancy. Now the company is completing an expansion program that will bring its daily delivery capacity to more than a billion cubic feet per day. **Pages 224-225.**

☐ **What's happening** in pipe line construction? Briefs from the industry on **Page 227.** Other pipe line features:

- Pipe Line Pete **Page 226**
- Pipe Line Hints **Page 232**

INTERNATIONAL ARTICLES

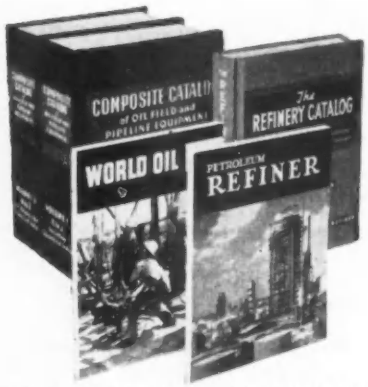
☐ **Camp life in East Texas** is closely knit with city life. But even so, oil company employes who assume the same duties and responsibilities as others are united by camp activities. For a glimpse at Shell Oil Company's East Texas District camp at Kilgore, in the heart of the famous field, turn to **Page 241.**

☐ **There'll be some changes in Tunisia,** the land of the sailboat, camel and bicycle, if a wildcat currently being drilled there finds oil in commercial quantities. See **Page 247.**

☐ **What's ahead in Germany?** Hary von Rautenkranz is in charge of all foreign and domestic operations for Internationale Tiefbohr KG., known as Itag, Celle, Germany, the only German company actively interested in drilling, production and equipment manufacturing. WORLD OIL has asked him some questions. The answers are on **Page 248.**

☐ **Russia is making trade overtures.** Hungary has set a new drilling record. Albania has ordered its petroleum exploration budget upped. Geophysical exploration in Switzerland has been scheduled. For these and other notes of interest throughout the world, see "A World of Oil" beginning on **Page 249.**

☐ **Two Sicilian research permits** have been granted Anglo-Iranian Oil Company, according to Anniable Bianco, Sicilian government official. One is 117 acres at Ravanusa (Agrigento) and the other 83 acres at Vittoria (Ragusa), where geophysical research is being carried out. For more details of this and other international news items, turn to **Page 256.**



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WORLD OIL and **THE COMPOSITE CATALOG** for the drilling-producing-pipe line industry.
PETROLEUM REFINER and **THE REFINERY CATALOG** for the refining-natural gasoline-petrochemical industry.

RAY L. DUDLEY, President, Publisher
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Indexed by Industrial Arts Index and Engineering Index

Looking Ahead . . .

. . . **Operators should be able to get enough steel goods** and other scarce materials to carry out planned drilling despite end of priorities assistance June 30. But they may have to shop around to fill needs for oil country tubular goods, which remain in tight supply. Controls are limited now to priorities on goods for military and atomic programs.

. . . **Weak tanker market may not improve** before late summer or fall—if then. Increased movement of fuel oils from Gulf and Caribbean points to U. S. East Coast may then strengthen tanker rates. Lay-ups of tankers are increasing, as rates are lowest since World War II. Coastwise and worldwide operations have become unprofitable for American flag vessels, especially older and smaller ships. Around 75 or more vessels of world tanker fleet have been idled.

. . . **U. S. Navy's oil exploration operations in northern Alaska will be closed down by October 1.** Some heavy oil field equipment is being stored in Alaska. Remainder is being transferred to other governmental units. Some other materials and equipment will be reassigned to Air Force and Department of Interior. Navy Secretary Anderson, in closing down Alaskan Naval Reserve, said the $45 million project has been "unsound."

. . . **U. S. crude refining capacity will increase** by 365,000 barrels daily during 1953 and by 306,000 daily in 1954. Compared with capacity of 7,734,000 barrels daily Jan. 1, 1953, total is forecast at 8,099,000 for Jan. 1, 1954, and at 8,405,000 daily on Jan. 1, 1955. These are PAD estimates.

. . . **Continued expansion of demand for heating oil** is confidently expected by men in fuel oil departments of oil companies. Compared with 6,366,000 oil burners in use for central heating in 1952, 10 million will be in use by end of 1960. Demand for oil burners will be provided by new homes, conversions from coal to oil, and replacements of old burners. Natural gas is strong competitor of oil for fuel. But oil's competitive position is being strengthened by sharply rising prices of gas.

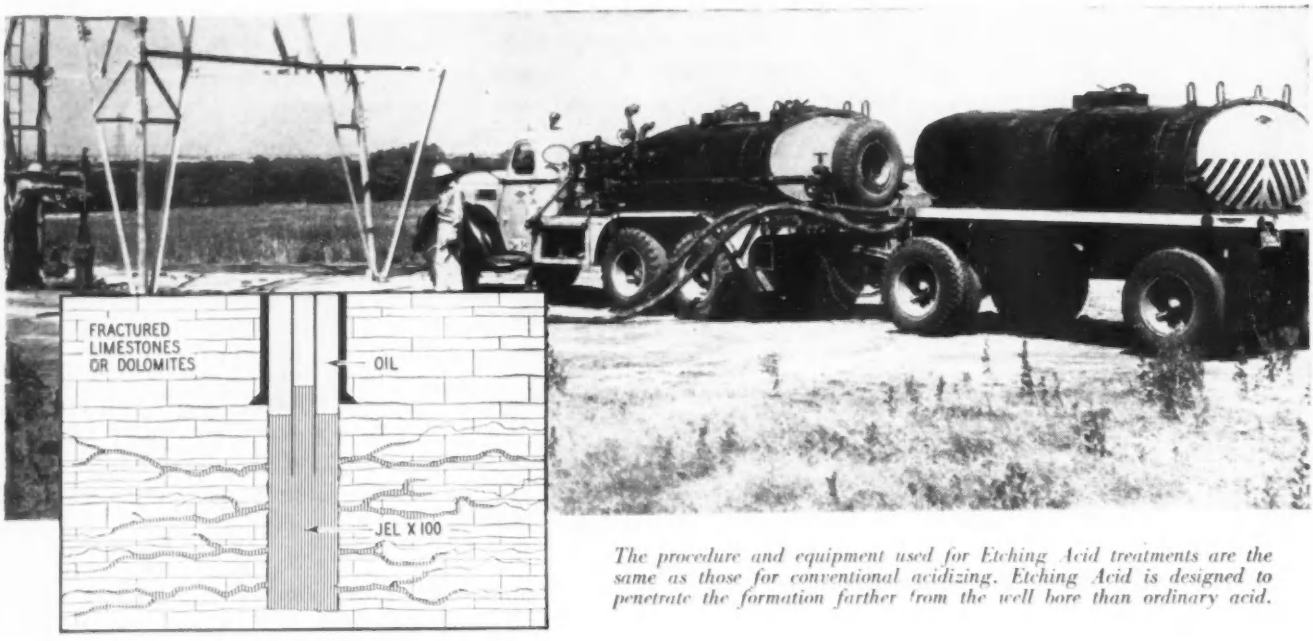
. . . **Puget Sound area will become an important oil refining center,** using mostly Western Canadian crude. Shell Oil Co. names Anacortes, Washington, 65 miles north of Seattle, as probable site for its planned $75 million refinery of 50,000 barrels per day capacity. About 30 miles farther north, at Ferndale, General Petroleum Co., Socony-Vacuum subsidiary, is building a plant for processing 35,000 barrels daily.

. . . **Some proposed European refineries have been criticized** by MSA. The need is questioned. Under close scrutiny, for example, is proposed U.S.-aided refinery for Greece. If built, the plant may get crude from Gulf Oil Corp., reports indicate.

. . . **U. S. government's "international cartel" suit** against a group of oil companies has been brought nearer settlement by government's withdrawal of objection to change of venue, sought by companies. Case was transferred to southern district of New York from Washington. Government attorneys explained they wanted to speed trial in view of existing world tensions and national security aspects of the case.

ETCHING ACID GAVE RESULTS WHERE REGULAR ACID FAILED

Etching Acid increased production 25 BOPD after ordinary acid treatment failed to boost output



The procedure and equipment used for Etching Acid treatments are the same as those for conventional acidizing. Etching Acid is designed to penetrate the formation farther from the well bore than ordinary acid.

Here's the case history of an oil well that was completed in a limestone formation. It failed to respond to a conventional acidizing treatment, so Dowell was called in for consultation on the job. Dowell engineers analyzed the well and recommended an Etching Acid treatment. This suggestion was followed and production was increased from 8 to 33 BOPD.

Etching Acid treatments, using Jel X 100, are primarily suited for use in limestone or dolomitic formations with either fractured or vugular porosity.

Etching Acid is designed to etch fractures or "vugs" . . . to clean fractures by removing calcite, mud, silicate and feldspar materials . . . to penetrate formations far from the well bore before the acid becomes spent. No auxiliary jel-breaker solution is required following Etching Acid.

If you would like to know more about Etching Acid or any of the many other Dowell oil field services, contact the nearest Dowell office. Or, if you prefer, write directly to Tulsa, Dept. G-13.

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Why Do They Call It That?

As these lines are written, there is much talk about what must be done in the way of raising funds for the Federal Government's needs and about what will happen to this tax measure and that. Hardly an American citizen but is affected by one tax plan or another, either in use or proposed.

That there is heavy need for public funds may not be denied, but in the raising of them, let us, at least, be sensible and be honest.

Among the taxes proposed for continuation, there is one which should be particularly obnoxious to any person employed in industry, to a person employed in agriculture, to professional men or women or to any one whose pension depends upon a sound economy. It should find no friend in any intelligent person. If that misses anybody, the miss is unintentional because this particular tax is a tax upon future jobs and future security.

It is the worst misnamed tax known to man and is the kind of tax which should only be applied in the direst extremity and then only with the most careful discretion.

It might well be termed a tax against future lathes in the factory, against the development of new ideas in commerce, a tax ultimately against the safety of our country.

•

Yet this deadly medicine of stagnation has been given such a sugar-coating in its name that millions of Americans roll it in their mouths, savoring the coating as candy, not yet tasting the poison it conceals.

They call it the *Excess Profits Tax*.

This name, applied by politicians who had a contempt for the intelligence of the Electorate, would seem to indicate that it is a tax conceived to keep "industrialists" from exacting exorbitant profits by reason of some public emergency. Deliberately some of the politicians have tried to tie it up on the minds of the unsuspecting public with "war profits," or "swollen profits on war orders." They have trusted to the public's forgetting that "renegotiation" was deliberately created to prevent exorbitant war profits, to limit the profits on any governmental job to a reasonable profit.

•

As a person who cheerfully, who gladly, paid every tax imposed by the Federal Government during World War II to help win the war, as a loyal American citizen who still is willing to pay his just part of insuring the peace, as an individual who decries the wastefulness of past, present or future National administrations for which, willy-nilly, present or future administrations and generations must pay, the writer objects to the principles of this so-called excess profits tax and objects still more to the grossly misleading name it has been given.

A better name would be "a Tax Against the Future," and "Anti-Replacement Tax," and "Anti-Survival Tax." Yet none of these names quite does it justice for it is all of these things and more.

•

But it is not so much the imposition of an emergency tax, unwise though it may be, that disturbs us as, it is the apparent failure of many of the people and the politicians to grasp the insidiousness of the principle involved and the goal toward which such thinking must lead us.

America has grown powerful and her people have achieved a standard of living so high that our pinkos and reds hate even to hear the matter mentioned. This growth has come by

reason of a progressive spirit which has taken advantage of every possible improvement of machinery or method. This improvement has been made possible in turn by a profit-making system which has always provided the money necessary to adopt progressive procedure. We are not simply writing words—we are stating facts that are undeniable.

•

Now let us picture a concern which, by investment of a certain substantial amount of money, was able to take on more business at a lower price to the consumer than it had hitherto been able to handle, and still make enough additional profit to pay off, over a period of years, the loan necessary to get the money to buy the new equipment and buildings. By mortgaging all of its properties, the company could borrow the money, maintain or even increase its payroll, and build up taxable properties in its city, county and state and put itself in a position to continue a steady annual income tax contribution to the Federal Government, and still pay a dividend.

The whole thing was sound. There was expected to be substantially *new business* which would make substantially *new profits*, not *excess* nor *exorbitant* profits.

What happens?

An excess profits tax law is passed. It takes insignificant consideration of how the increased profits were earned, but it does take 82 percent of those profits! Is this an exaggeration? Not at all. It has happened and is happening literally thousands of times all over the country. The company in question has been caught in a jam, but not because of any "excess profits."

•

If the tax to kill the goose that is laying the golden egg becomes fixed as a matter of national policy, it will stop progress, will destroy the ability of an employer to operate his business so as to continue employment, and will make the nation utterly vulnerable for either a war or a depression which may be around the corner. How the Kremlin must enjoy this self imposed dope we Americans are taking!

A depreciation allowance is made on machinery or buildings used in a business, but now it costs two and one-half to three times as much to replace the equipment as it did originally to buy it. True the new machinery may be more productive, but not *that* much more productive, so the "kill the goose tax" hurts proper replacement because now the depreciation fund must be supplemented by other money, either profit money or new investment money. New investment money shies away from the investment which cannot pay itself out.

•

Expansion, necessary to provide both employment and products for an increasing population, becomes a dream.

Even the late-lamented Truman administration was forced to recognize this fact and make special dispensation in the way of depreciation allowances to provide for expansion of certain needed types of plants. Many of them were built by the oil industry.

But unfortunately, the evils of the "goose tax" are not confined just to the company whose progress has been checked or to the company whose ability to pay for already contracted improvements has been damaged. It cuts down the businesses of all who make the many things needed by those companies and ultimately it becomes a tax in favor of reduced efforts, reduced payrolls, stagnation.

If ours is such a present dire emergency as to require the continuation, even for only six months, of such a tax, let us be honest and call this thing by a more accurate name.

"Excess profits tax"! Phooey! You name it!

Ray L. Dudley

International Fireman—M. M. Kinley

On crutches or on horseback, he goes about his hazardous job with practiced calm, even when somebody asks: 'Why don't you just put water on it, Mister?'

By AL REESE, WORLD OIL Staff

Part 1

MYRON M. KINLEY is without a peer in his specialty because he is tenacious, ingenious, and is the owner of a practiced calm which has never been ruffled by a wild well, and almost never by:

(1) bystanders who inquire, "Why don't you just put water on it?" and

(2) reporters who saddle up their typewriters and canter off into the golden sunset with something like this: "When M. M. Kinley shuffles off this mortal coil, there'll be only one place for him to go. If they summons him in the other direction, he'll put out all the fires and send them a bill for $100,000."

For almost 30 years Kinley has methodically labored to establish his profession as a routine, if albeit spectacular, serv-

—Courtesy the BP Magazine

HE'S LAUGHED AT DEATH many times and methodically gone about establishing his trade as another routine specialty to the industry. Kinley (top of page) had not recovered from severe injuries when he tackled fire in Monument field, New Mexico, in 1937.

ice like fishing, logging, or cementing. For the same number of years the press has proclaimed him in progressively larger type as a latter-day St. George who burps the dragon by ramming dynamite down its flaming maw. And titillated arm-chair firemen have responded by heaping advice upon him. Like, for instance, the woman who volunteered to pray a fire into submission—for a price, of course.

With these annoyances, Kinley has almost always exercised patience as the price of recognition. For many years he needed all the help he could get to win a toehold in an industry which as late as the early 1930's usually capped its wild wells without outside aid.

Wanted An Answer. But there have been lapses in his equanimity. An onlooker at the Greta fire in Refugio County, Texas—toughest job in the Kinley career—repeatedly asked how much longer it would take to extinguish the blaze. Kinley wished he knew, and said so. But the man wanted a definite answer, so Kinley finally obliged "Listen, I have ordered a specially-constructed cork stopper. As soon as it arrives I am personally going to stab it in the pipe."

For the double purpose of persuading the press and a nervous plane pilot that placing dynamite at the mouth of a burning well or flying it around the country wasn't particularly hazardous, Kinley once dropped a hunk of the stuff from an airplane to prove it wouldn't do anything except bounce. At least the pilot seemed convinced, for he continued to fly Kinley and his dynamite with no outward sign of trepidation—even on the day they got lost in a snowstorm.

This stage when he took his own explosive to a fire was the second in the Kinley career. At the very first, he employed a special fire truck, nozzles and hose, gas masks, inhalators, stretchers, first aid supplies, a complete set of non-sparking and heat-resisting tools, and a five-man crew who waddled about in asbestos suits and hardboiled helmets with heat-resisting glass windows.

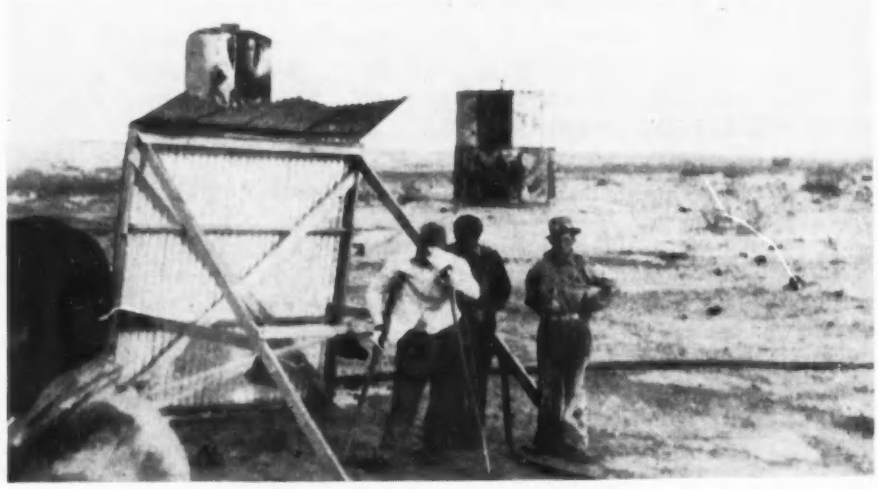
Nowadays, Kinley takes along a few extra layers of clothing—nothing more.

The transition has been largely due to the increasing scope of his activi-

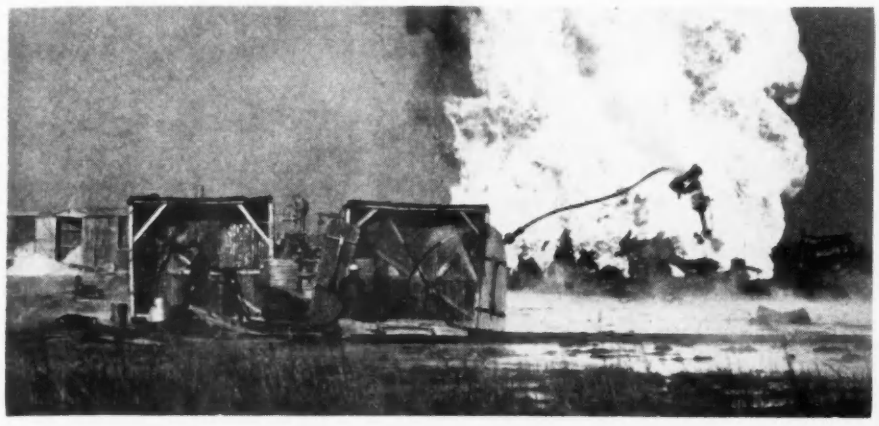
How he does it . . .

1. KINLEY PACKS nitro in asbestos-lined containers . . .

2. CHARGES PUSHED into position, sometimes on contrivances like this . . .

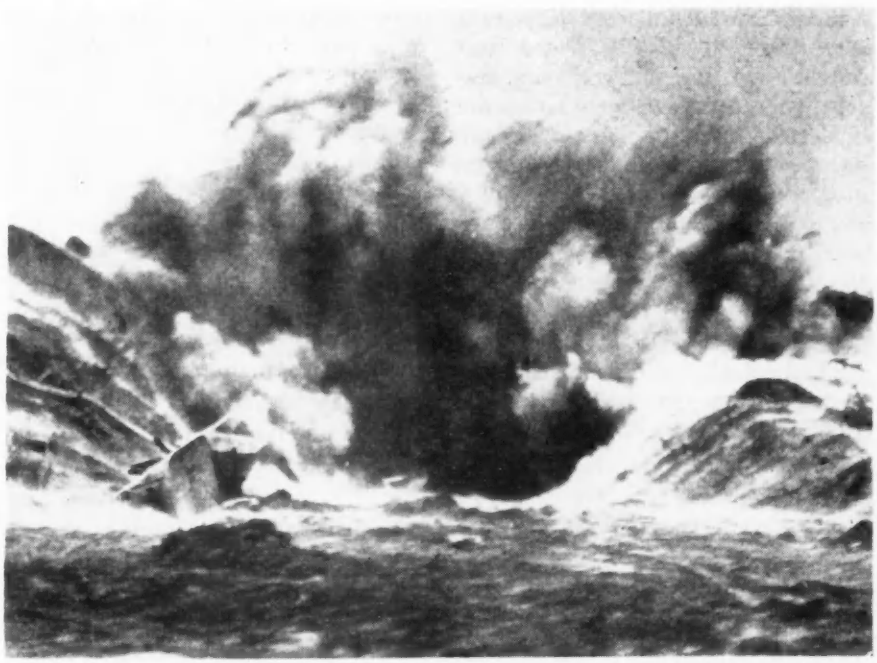


3. SHIELDS LIKE THIS provide protection from blaze . . .



4. OR MORE ELABORATE guards like this . . .

5. KINLEY DEVISED this canopy in Iranian fire of two years ago. It was shoved about by a tractor . . .



6. TO SET OFF BLAST like this one that killed great Roumanian fire of two decades ago.

ties. The time factor forced him to abandon surface travel for the airways and to do his job with whatever material the locality can provide or his imaginative brain can improvise. If neither suffices, he sends for what he needs. If it isn't right when he gets there, he orders again. During a fire in New Mexico, mechanics toiled all night cutting threads on a hookup for water and mud lines. Next morning Kinley examined the apparatus and decided it wasn't right.

"That," said a company official, "was the quickest end to a whole night's work I ever saw."

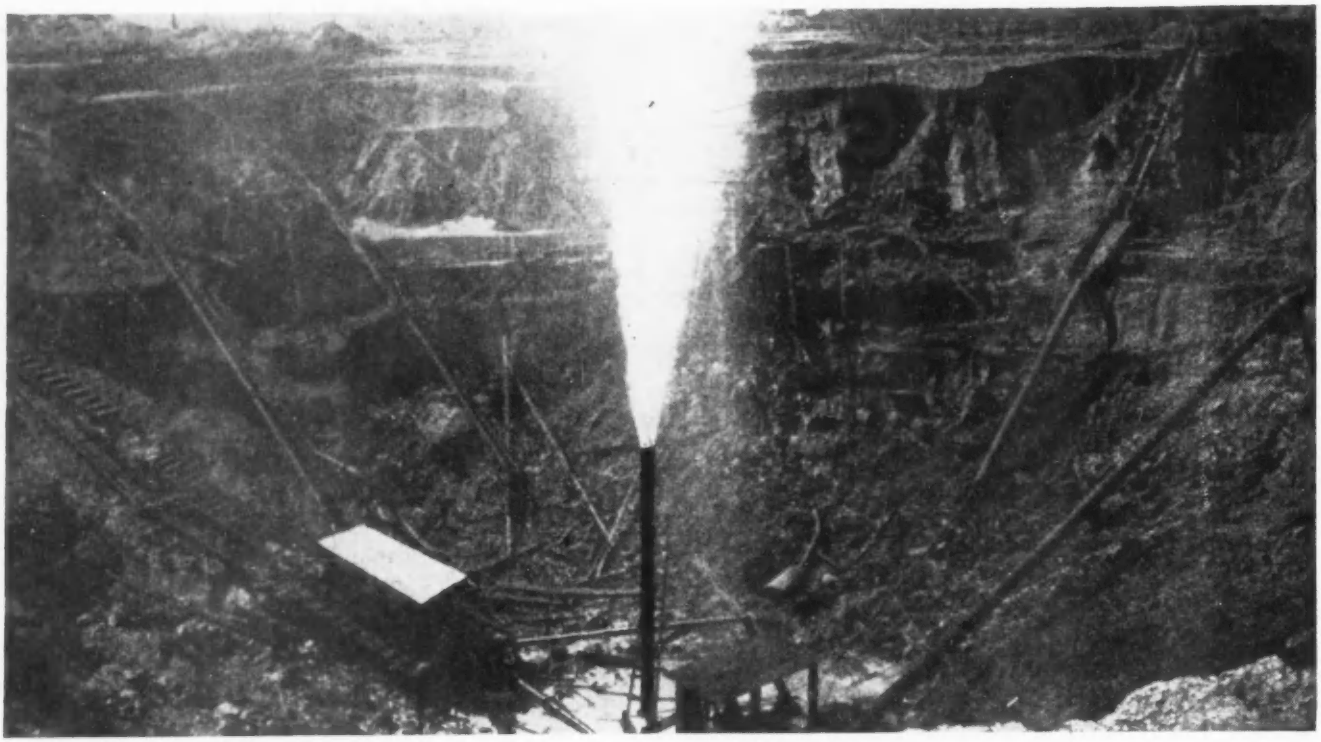
One essential tool quickly obtainable everywhere is gelatinized nitro or dynamite. The explosive is packed into containers—usually oil drums lined with asbestos—and affixed with electric caps and wires which set off the explosion.

Manpower is also available at the well site, though it was not always so. The late Floyd Kinley, brother of M. M., once recalled that their father, Karl T. Kinley, was bearing a package of explosive to a well's mouth while a lone assistant followed at a discreet distance, playing a stream of water over him. Suddenly, the assistant dropped the hose and ran. Caught without protection in a sudden blast of heat, the elder Kinley gave the package a high, hard heave and bolted for safety.

Upon arrival at a troubled well, Kinley wanders about with the deliberate, calculated movements of an eight-day clock. After studying the situation, he proceeds to tame the well by assuring an adequate roadway to the site, tying into an abundant water supply, clearing away the hot debris, snuffing out the blaze with explosive, and capping the flow.

However, if this oversimplified recitation were the true extent of the procedure, Kinley would not now be the dean of the industry's most undercrowded specialty. Each of the more than 300 wild wells he has conquered has posed a new and savage challenge to his ingeniousness and tenacity. A classic example was the Greta well that blew wild for 3½ years and waged an eight-month battle with Kinley before it gave up.

Toughest Job. The Greta blew out



TOUGHEST JOB IN KINLEY'S CAREER. This well in the Greta, Texas, field blew out and cratered, destroying the main highway and railroad right-of-way. The well blew wild for 3½ years and resisted Kinley for eight months before surrendering.

in May, 1936, and gnawed out a crater that engulfed a highway and railroad. Two relief wells and various other methods had failed when Kinley volunteered to do the job or ask no money for his efforts—the only time in his career he has made such an arrangement.

When Kinley began the struggle the crater was 300 feet in diameter, 72 feet deep, and seething to ground level with water.

He pumped out the crater, a months-long task that wore out three centrifugal pumps. Then, strangely, the well ignited itself. Four times this happened. One trade publication supposed that the gas underwent a chemical change of some sort and ignited upon mixing with air. Others laid the phenomenon to static electricity.

Kinley finally discovered that the flow was coming through the drill pipe, 72 feet below ground level. He capped the well with a valve and pumped in cement to kill the flow.

Kinley's list of his toughest jobs includes none of the three wild wells which have injured him, although one of these claimed some of the biggest headlines of his career. The death of nine men, Kinley's injury and rescue, his return to action on horseback, his use of such unorthodox tools as a battering ram and an airplane motor—all this added up to a running story that drove the press to near-hysteria.

The Cole 1, in western Gregg County, Texas, near Gladewater, came in as a 25,000-barrel well in April, 1931. Some of the 14 men on the floor ran to cut the boiler fires, then returned to help set a boll weevil. Another minute and the job would have been finished. But the well caught fire as the plug was being lowered. Oil-soaked men were set aflame. The string of pipe, plug and kelly dropped, shearing off the lead of the plug and allowing the pipe to fall to the bottom. About 20 feet of kelly joint extended out of the hole above the 6⅝-inch casing. The swivel joint rested on this.

Kinley arrived to find the gooseneck shooting fire outward into the molten debris and downward into what had been the cellar.

A 60-foot battering ram was used in a vain attempt to concentrate the flame by knocking off the kelly and gooseneck.

Then Kinley moved in with a cutting torch to remove the devil's spiderwork of debris. Brother Floyd and others edged forward behind metal shields and sprayed him with water. The motor and propeller from a plane were brought up on a truck to blow the flames from the fighters.

The task seemed endless. The derrick and drawworks required hours to cut and draw far enough away that the blaze wouldn't be re-ignited when the time came to snuff it.

Kinley Trapped. On the fourth day, while Kinley was cutting away the drawworks, a beam fell across him, breaking and pinning his ankle. Floyd ran into the furnace, but couldn't budge the beam. Others followed. M. M. was taken to a hospital, the ankle set, and two hours later returned to direct operations, now on horseback and now limping about on crutches.

Work went on for eight days before the debris was cleared. Then 200 pounds of dynamite was placed on a platform and skidded to the edge of the flame. Wiring from the explosive was strung 50 yards to a storage tank, which was filled with water to serve as a barricade. Kinley touched off the charge. A beam sailed end over end and pierced the tank shielding the fire-fighters. The blaze was out.

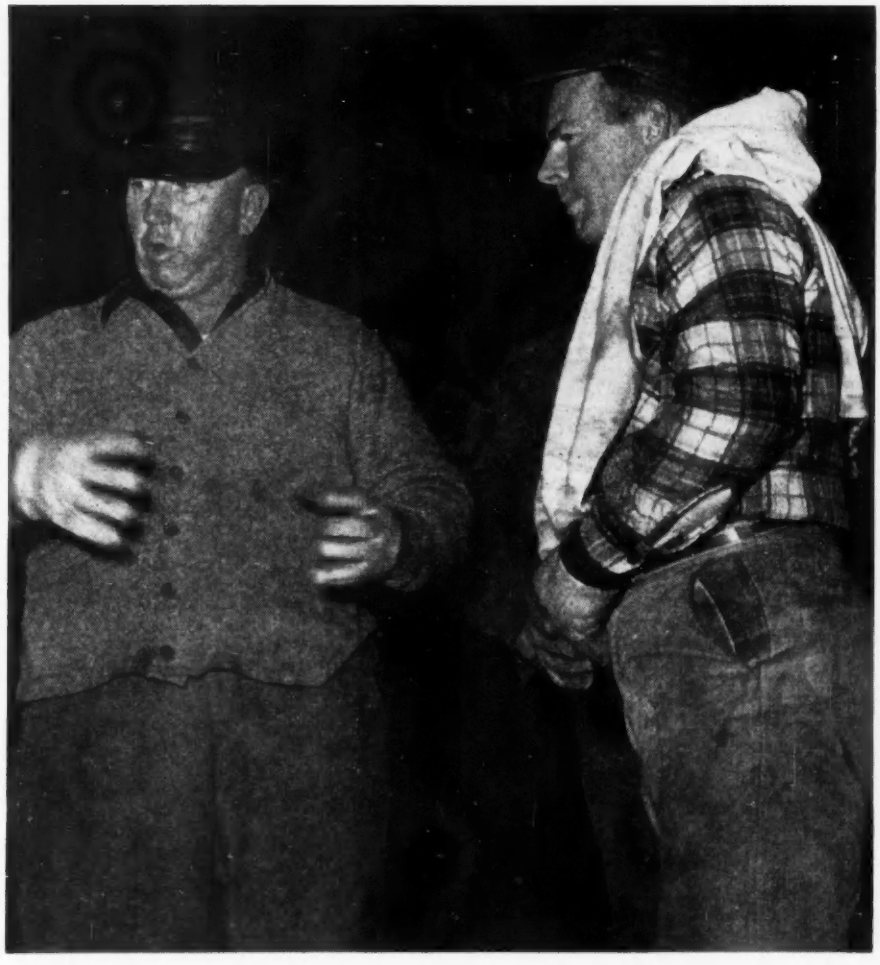
Another fire that Kinley fought with dynamite in one hand and a crutch in the other revealed anew a

characteristic which has glamorized him almost as much as his apparent disdain for longevity. This is a belligerent eagerness for his work that, transcending mere enthusiasm, causes him to react as if each new fire were a personal insult.

In 1936 he was preparing to shoot stuck drill pipe at a well in Matagorda County, Texas. A steel shell which had not been properly cleaned of explosive was put under the welder's torch and exploded. Kinley received injuries the length of his right side.

Shortly afterwards, a well in the Monument field, New Mexico, blew out and caught fire, killing three and injuring seven. Kinley gathered up his crutches and went into action.

(Kinley was also hospitalized in 1945 when a Venezuela blowout caught fire and burned him severely. It was also a blowout that killed his brother Floyd in 1938. He was capping a well in Goliad County, Texas, when it blew him off a platform.)



KINLEY PLANS STRATEGY with his right-hand man, Paul (Red) Adair.

The Iranian Fire. Ironically, many of Kinley's technical masterpieces have gone comparatively unnoticed because they were unaccompanied by death, unusual destruction, or spectacular incidentals. The Iranian job of two years ago was saved from this limbo only because of its exotic Middle Eastern setting and Kinley's 7500-mile battle charge—longest fire run on record except for a Kinley job in Qatar.

Fish was being pulled through a gas zone when the Iranian well blew out and caught fire. Kinley arrived to find part of the fishing string jammed in the hole. The wellhead was guarded by a hundred lashing tongues of flame encircling the fiery latticework of the collapsed derrick.

Heat blocked the road to the well. Another road was built.

Somehow, this thirsty land must be made to furnish water—lots of water. A canyon was dammed and a 22-mile water line was laid.

The intense heat from the widely dispersed flames made it necessary to elaborate on the usual fire shields. A portable shelter was constructed by fitting sheet metal over a steel frame. One end of this canopy was supported by a tractor, enabling it to be nudged about by lifting and shoving. Under cover of this device, which was constantly sprayed with water, the debris was cleared.

Next was the problem of concentrating the flame. Kinley packed nitro into a 40-gallon drum and placed this in a 400-gallon tank through which water was circulated. The tank was pushed to within a few feet of the wellhead by means of drill pipe and a bulldozer.

The explosive was set off. Half a mile of drill pipe climbed into the air and flopped back like wet macaroni. A single spurt of flame remained. The blowout preventer was gone and the wellhead severed just above the main valve.

Kinley readied another charge and suspended it from the center of the canopy, which was maneuvered very close to the flame under a torrent of water sprayed from every source. Even a nearby swimming pool was emptied. This shot snuffed the lone flame.

Kinley ordered from the U. S. and England a casinghead and hangar and pressure-operated valve with side outlets. The cellar was excavated and opened on three sides, baring about 30 inches of casing. The 16- and 11¾-inch casing were cut away, exposing the eight-inch.

When the wellhead assembly arrived it was lifted with a long jib crane and dragged through and over the gas jet by manpower and chain jacks.

The capping of this well is rated by Kinley alongside with such vicious jobs as the Greta and the Roumanian fire—the blaze that killed 14 men, that burned so long it was known as Roumania's "permanent" fire, that caused one government to fall, and was actually protected by another.

(The concluding part of the story of this international fire-fighter will appear in the August 1 issue.)

A WAR-TIME DEVELOPMENT of importance in hurricane forecasting is this weather facsimile which transmits approximately 55 plotted and analyzed weather charts daily from government weather office in Washington. A. H. Glenn and Associates' forecasters operate this receiver on a 24-hour schedule during the hurricane season to analyze weather developments over the Northern Hemisphere which ultimately affect the Gulf Coast.

When the Big Winds Blow

. . . not even the Weather Bureau's efforts provide maximum efficiency and safety. Nothing less than pinpoint forecasting will do.

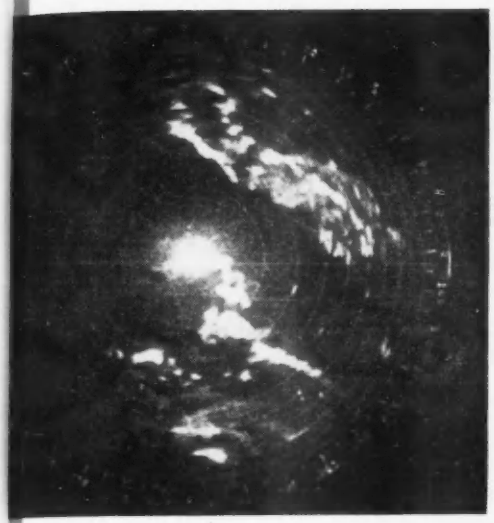
By AL REESE and ROBERT E. SPANN, WORLD OIL Staff

THE VULNERABILITY of offshore rigs to high winds is compounded by wind waves, surf conditions, swell and storm tide. Hence, basic precautions have only a limited value, and not even a tightly overlapping radar screen added to all the services of the Weather Bureau would provide maximum safety and efficiency. Moreover, each rig involves such a multitude of variables like water depths, rig design, distances from shore, and the status of operations at a given moment, that nothing less than a strictly localized forecast of all the threatening elements will suffice.

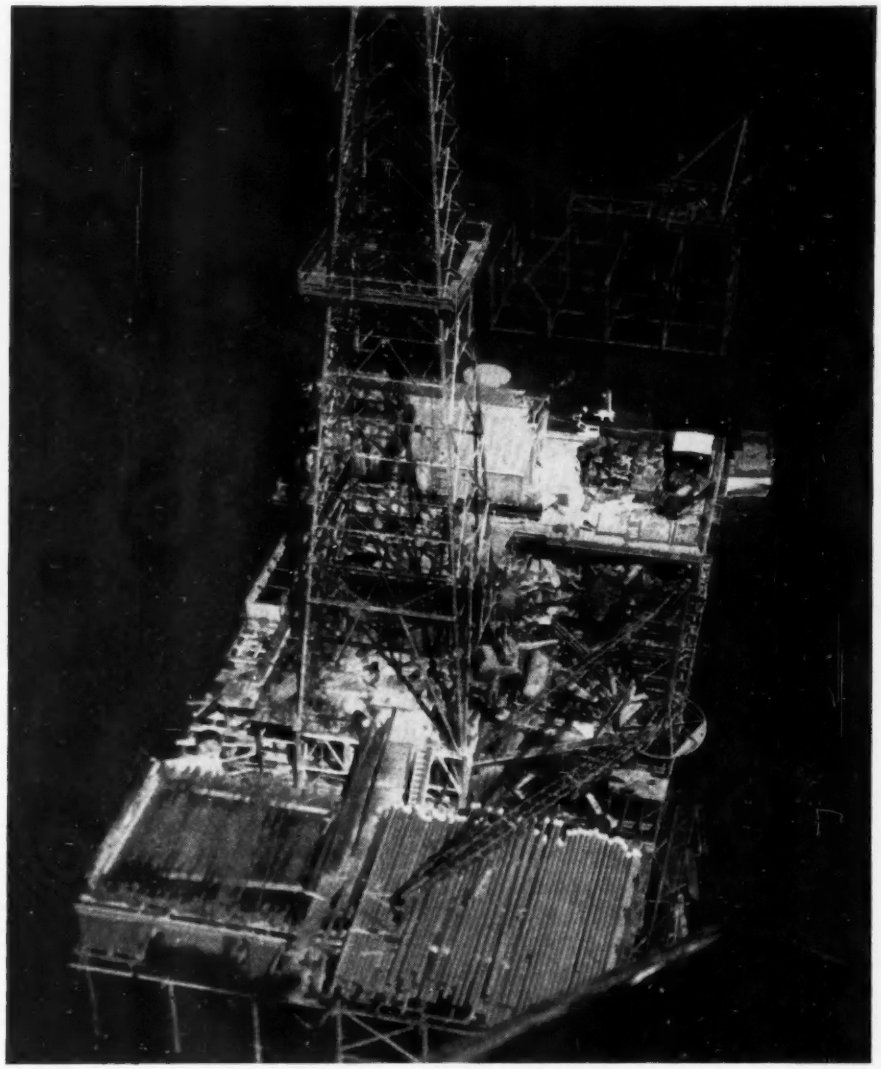
Forecasting Service. Humble recognized this when offshore operations were being planned in the summer of 1947 and decided that the answer was a forecasting service which could predict wave heights and wind conditions for each rig. Subsequently, a radar set was installed at Grand Isle, La., and a forecasting experiment conducted, using the techniques and sciences employed by the Armed Forces during World War II. The experiment was successful, and the firm of A. H. Glenn & Associates of New Orleans was organized to serve operators ashore and offshore. Until the curtailment of offshore operations caused the shutdown of the Grand Isle station in April, 1951, it was operated on a seven-day per week basis. At the present time the Glenn

Part 2

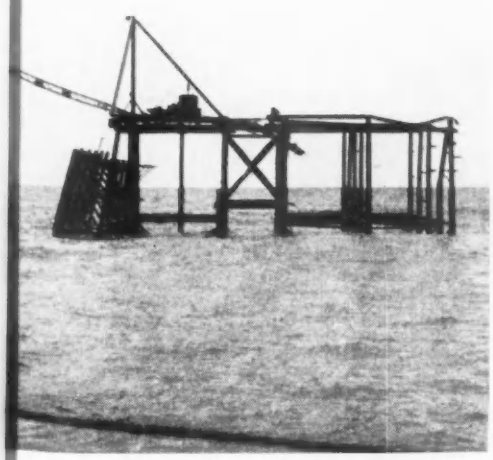
1. THIS IS HOW the hurricane looked on the Dow Chemical Company radarscope at a distance of 180 to 200 miles. Winds came directly at plant, forcing it to close.



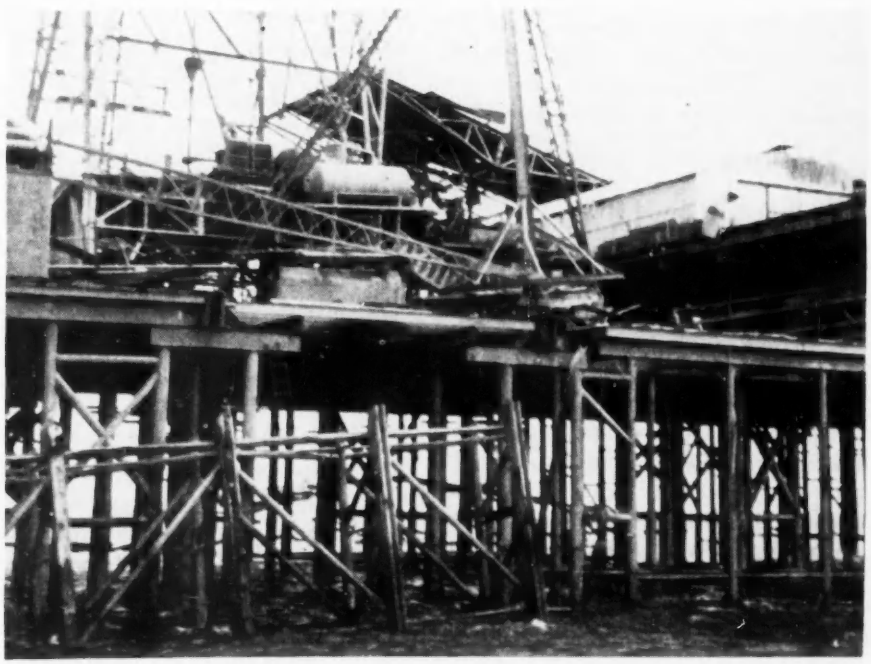
. . . a hurricane in the Gulf of Mexico, in Oct., 1949, did this . . .



2. THIS OFFSHORE RIG in the Gulf was ravaged by hurricane's force.



3. THE WINDS did this to the quarters island. On it were located two small houses containing crew's quarters and mess hall.



4. MAIN DECK, which was 28 feet above mean Gulf level, was hard hit.

firm is providing forecasts for ten operators on the Gulf Coast.

Glenn uses the Weather Bureau's services as an initial basis for forecasting the feasibility of transportation, drilling or production at a given offshore installation and at a given time. Contact is maintained with field personnel of the company concerned, and major decisions, such as evacuation, are based on telephone conferences between the executives who must decide and the meterologists who are aware of the company's operational problems.

In its studies of offshore problems, the Glenn organization found that an average of 24 hours are required to evacuate an offshore structure, which consists of removing drill pipe from the hole, moving unpropelled vessels to hurricane anchorage, evacuating personnel from rigs and anchored vessels, and possibly evacuating shore bases if storm tides are expected. A minimum of 36 hours are required to resume operations.

Aiding in the safety and efficiency of both onshore and offshore installations would be the Gulf Industries Weather Network, which according to one of its members is "now bogged down in Washington red tape." The network was organized in 1950 to purchase, install and maintain radio stations at Weather Bureau offices in Brownsville, Corpus Christi, Houston, Lake Charles and New Orleans. These stations would be utilized solely by the Weather Bureau for:

- Backup communications between the Weather Bureau offices at times when the existing land line communications failed or became overloaded.
- Disseminating information regarding unusual weather conditions during critical situations.
- Gathering vital information and data regarding unusual weather conditions.

Organizers of the network recognized that "one very serious problem encountered during the war years and which is very apparent at the present time is that of getting maximum output . . . and the most logical approach to this is to prevent any shutdown that can possibly be avoided. Plants using involved processes require relatively long periods for shutting down and starting up, with the attendant loss in output. Shutdowns that do not allow sufficient time for the proper reduction of the high temperatures and pressures subject the plant and personnel to hazards that might possibly prove disastrous."

Among members of the network are Carbide and Carbon Corporation, Texas City; Celanese Corporation of America, Bishop, Texas; Central Power and Light Company, Corpus Christi; Cities Service Refining Corporation, Lake Charles; Dow Chemical; E. I. du Pont de Nemours and Company, Orange, Texas; Monsanto Chemical Company, Texas City; Pan American Refining Corporation, Texas City; Southern Alkali Corporation, Corpus Christi; Taylor Refining Company, Corpus Christi; Mathieson Chemical Corporation, Lake Charles; Aluminum Corporation of America, Port Lavaca, Texas, and Copano Research Foundation, Victoria.

What Others Do. Elsewhere around the globe storm precautions are generally fewer. In Mexico, a blind spot in the Gulf radar chain, the public relations department of Pemex reported that "no problem exists and no specific system has been set up because there is no need for it." It was added that "Pemex does have its own extensive radio network through which warning and instructions could be sent should the occasion ever arise, and the spokesman for Pemex emphasizes that if an alerting system were necessary, it would have been set up long ago. . ."

Cuba is alert to the storm threat. Two observatories observe regular contact with the meteorological station on the island of Grand Caiman, south of Cuba, and with the Weather Bureau in Miami. When a storm approaches, the observatories issue three bulletins each day to radio stations. Most dangerous to Cuba are the storms which originate in the vicinity of Swan Island, near Grand Caiman in the Caribbean. However, these big winds strike most often at Cuba's three western provinces, where oil activity is slight. The only major operator now on the island is engaged along the north coast of the two eastern provinces, where there is less danger of weather disturbances.

Oil companies in Eastern Venezuela, which is fairly free of tropical storms, depend on the local government weather bureaus. Western Venezuela has a particularly vicious problem in the "chubascos," very heavy rains accompanied by strong winds of short duration. Since a characteristic of the chubasco is the suddenness with which it appears, little can be done about it.

Trinidad, which is approximately 200 miles south of the hurricane zone, has had only one hurricane within living memory. That was in 1937, when big winds toppled more than 100 derricks. The chance of a reoccurrence is considered so slight that no special storm precautions are taken. The island has a meteorological office which would alert the populace in an emergency.

Western Canada's weather alerting system is similar in many respects to that in the U. S. Mid-Continent. Storm warnings are issued when necessary by the Dominion meteorological service through local weather units, which release warnings over commercial radio stations. Most companies maintain short-wave radio equipment, with headquarters in Edmonton or Calgary, to warn men afield, and several firms have installed telephones in company cars. Planes and radar are not used, and few companies have formal programs for shutdowns.

Oil operators in the Pacific depend heavily on information received by radio from U. S. Army, Air Force and Navy bases.

The primary responsibility for safeguarding U. S. government oil facilities abroad rests with the local post, camp, station or unit commander. This responsibility, frequently spelled out in detail by higher headquarters, includes the establishment of appropriate measures for the protection of petroleum supplies at the station, storage facilities, handling equipment, etc. Precautions to be taken necessarily vary with the type, nature and extent of each operation. Details are usually determined by the petroleum officer in charge.

Data concerning tropical storms, typhoons, tidal waves and similar hazards are passed throughout affected areas by the Air Weather Service of the Air Force. Based on these warnings, local commanders can take appropriate action to secure their installations against impending storms. —**The End.**

FPC Policies Curtail Gas Supplies

Transmission companies are discouraged from developing production and reserves. Gas and oil producers fear regulation of prices and earnings if they sell to interstate pipe lines.

By L. J. LOGAN, WORLD OIL Staff

CONSUMERS OF natural gas, sometimes described as the ideal fuel, eventually may suffer shortages of that product and pay higher prices for it as consequences of two existing or threatened governmental policies. Because of these policies, gas supplies already have tightened up greatly, and prices have increased sharply, though gas so far still is relatively cheap.

Prompt correction of these policies is urgently essential. Remedial action is required on the part of the Federal Power Commission, the courts and perhaps Congress.

- *Supplies of natural gas for interstate pipe lines are curtailed, in the first place, by existing FPC policy in dealing with a transmission company's own gas production.*

- *Natural gas supplies for interstate marketing are greatly curtailed, in the second place, by the persistent threat that producers who have no interest in gas transmission or distribution may be subjected to FPC utility type regulation if they sell gas to the interstate carriers.*

In determining the price a transmission company can charge for its gas, FPC uses the purchase price as the company's cost of purchased gas. But for company-produced gas, it allows as cost only the depreciated original cost of acquiring the gas. This policy disregards the fact that present replacement cost of virtually any gas produced is much greater than depreciated original cost.

Because of this FPC policy, the transmission companies sometimes must virtually give away their gas production or sell their producing properties. They are deterred from developing reserves and production of their own, although it would be to their advantage and the best long term interest of the consumers if they could profitably have substantial gas supplies of their own.

It is generally agreed that in the interest of the consumers as well as the companies, the major natural gas transmission companies should have substantial production and reserves of natural gas. They should not depend entirely on natural gas supplies purchased from others, as some are now doing.

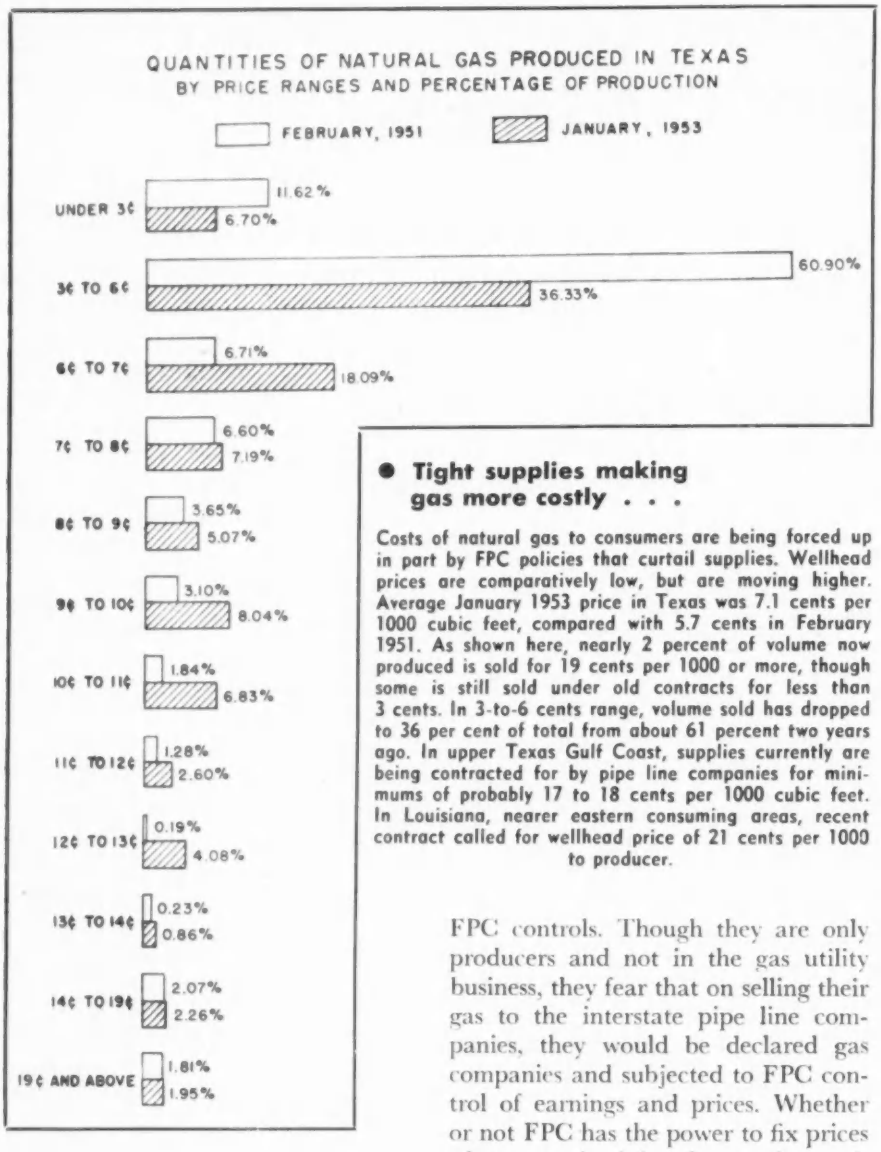
With some production of their own, they can more efficiently and more economically serve consumers. With such production, they have more flexibility of operations, achieve various economies, can better meet seasonal peak loads, and are in better bargaining position in negotiating with other producers for outside supplies of gas, thus holding down costs to consumers for purchased gas.

Some major natural gas transmission companies own substantial gas production direct, or in their own names. Among them are Panhandle Eastern Pipe Line Company, Southern Natural Gas Pipe Line Corporation, Columbian Fuel Corporation, Lone Star Gas Company and others. Some of the older companies hold producing properties through wholly-owned subsidiaries. For example, United Gas Corporation, which owns Union Producing Company and United Gas Pipe Line Company.

Some of the newer gas transmission companies originally had little or no gas production but are now developing and purchasing production and reserves. In some cases the transmission companies are acquiring only minority interest in producing affiliates, but in other cases they are organizing or purchasing controlled affiliates or subsidiaries.

Texas Eastern Transmission Corporation, owner of the "Big Inch" lines, organized the producing affiliate, Texas Eastern Production Corporation, which has acquired substantial producing properties and is doing some exploratory and development drilling. El Paso Natural Gas Company has a producing affiliate, Western Natural Gas Company, which has initiated an exploration and development program in Utah, Colorado, New Mexico and West and Southwest Texas. The company at present owns proved reserves of about 3.8 trillion cubic feet, mostly in the San Juan Basin. Directors of Transcontinental Gas Pipe Line Corporation have authorized a production affiliate, although it has not been organized so far. Tennessee Gas Transmission Company has 49 percent interest in the oil and gas producing company, Tennessee Production Company, which has been actively purchasing and developing gas and oil producing properties.

No Boom. Although some of the gas transmission companies lately have been expanding their activities in exploration and production, there is no boom in natural gas production. In owning or acquiring producing properties, the gas companies are hesitant, not confident. Under the established FPC policies, any economies achieved by a gas company through production of gas may be wiped out by action of FPC in considering the relatively low



● Tight supplies making gas more costly . . .

Costs of natural gas to consumers are being forced up in part by FPC policies that curtail supplies. Wellhead prices are comparatively low, but are moving higher. Average January 1953 price in Texas was 7.1 cents per 1000 cubic feet, compared with 5.7 cents in February 1951. As shown here, nearly 2 percent of volume now produced is sold for 19 cents per 1000 or more, though some is still sold under old contracts for less than 3 cents. In 3-to-6 cents range, volume sold has dropped to 36 per cent of total from about 61 percent two years ago. In upper Texas Gulf Coast, supplies currently are being contracted for by pipe line companies for minimums of probably 17 to 18 cents per 1000 cubic feet. In Louisiana, nearer eastern consuming areas, recent contract called for wellhead price of 21 cents per 1000 to producer.

cost of the company's gas as reason for lowering the price the company can charge for its gas.

Instead of buying or developing reserves, some of the major pipe line companies conclude that it may be more businesslike to depend wholly on purchased gas, despite the disadvantages of such a policy.

Under conditions that have prevailed, prices of purchased gas have been steadily increasing in recent years. New and expanded pipe lines have provided greater markets and increased the requirements of gas. But there have not been plentiful offerings of gas to the pipe lines. Some independent producers as well as some major oil companies with large gas reserves have declined to sell their gas, even at attractive prices. Their refusal to sell gas has been based to an important extent on threatened FPC controls. Though they are only producers and not in the gas utility business, they fear that on selling their gas to the interstate pipe line companies, they would be declared gas companies and subjected to FPC control of earnings and prices. Whether or not FPC has the power to fix prices of gas received by the producers is currently being tested in the courts.

Furthermore, oil frequently is produced along with gas, and if FPC can regulate gas production and sales, it logically could claim authority to control oil production and the earnings and prices of oil producers.

The consumers of natural gas as well as the gas transmission companies and the gas and oil producers are all affected adversely by the two above mentioned actual or threatened policies of the FPC:

- *The actual policy of applying to company owned reserves the "original cost" method of valuation in fixing rates charged for gas by the companies, allowing only about 6 percent return on the depreciated historical cost of reserves.*
- *The threat that FPC will regulate all field sales of gas entering interstate pipe lines.*

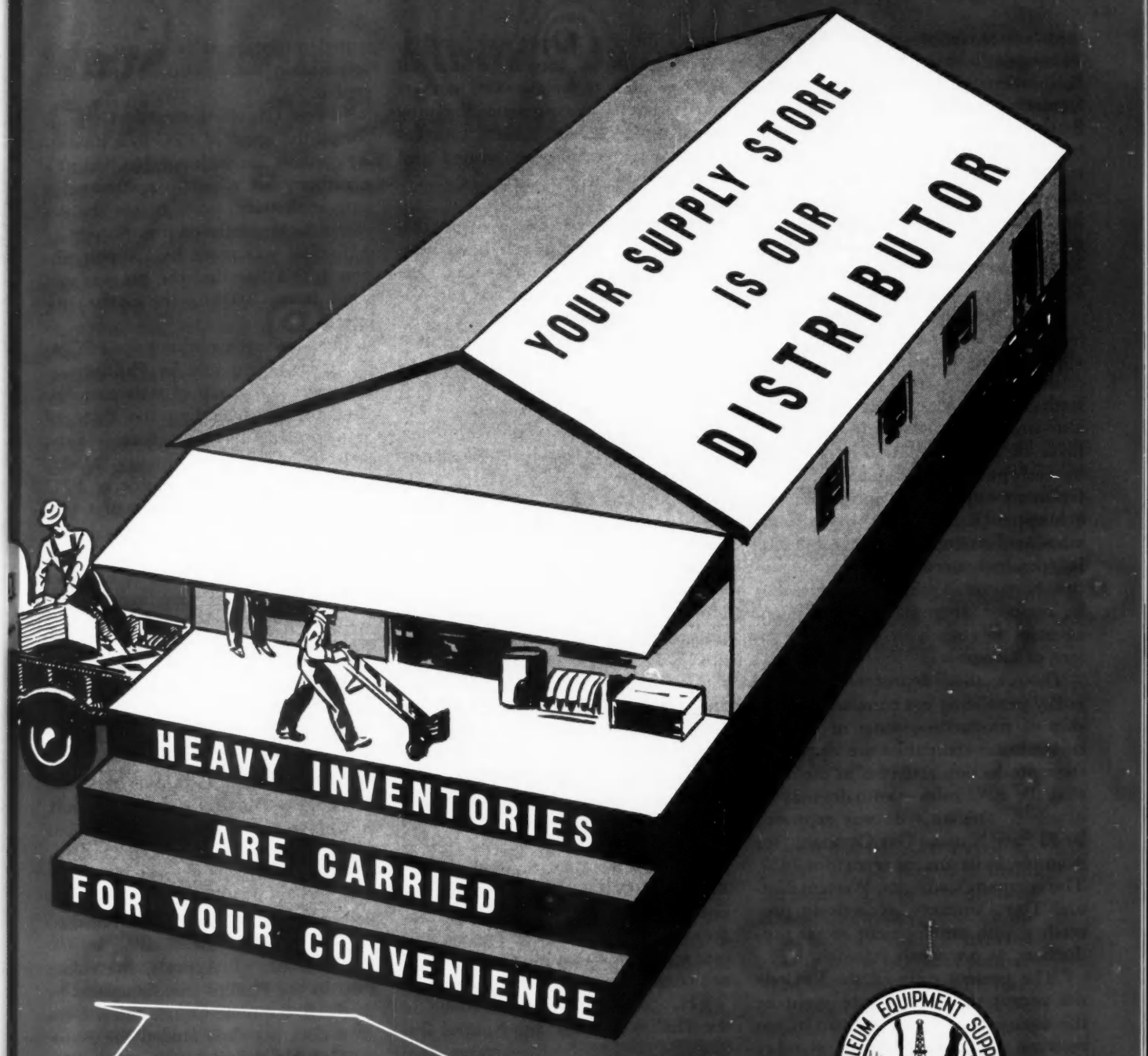
The FPC actual policy on evaluation of company-owned gas is detrimental to the long range public interest. As brought out above, it has discouraged gas pipe line companies from owning and developing production and reserves of their own. While the policy may result in slightly lower gas prices temporarily, it prevents economies in the gas business and ultimately will promote shortage of gas production and reserves and cause higher prices of gas.

In regard to this policy, natural gas pipe line companies have been given some hope that FPC may change its attitude. Nelson Lee Smith, FPC member, in a recent address went on record with the statement that "natural gas produced by interstate pipe line companies should not be priced differently in rate making from the gas which is purchased from independent producers.

"I see little logic," said Smith, "in discriminating between the gas which an interstate pipe line system purchases and that which it produces. While this does, to be sure, grant an apparent advantage to consumers in the form of somewhat lower rates, in the long run it provides a reason for pipe line companies to seek devices whereby they can further the immediate interests of their stockholders by separating their production properties from the operation of their interstate pipe line systems.

"I think this is pointed up," Smith continued, "by the fact that prior to 1938 and the passage of the Natural Gas Act, most of the major pipe line companies were also important producers of natural gas. As recently as 1940, eight major interstate pipe lines produced more than 47 percent of the gas which they transported and sold, as compared with only 18.5 percent of their total requirements produced by 15 major pipe lines in 1951. It is hard to believe that this is due purely to coincidence and completely unrelated to the rate making policies of the FPC. Yet it is generally recognized that the ownership of some production is advantageous to pipe lines, both in bargaining for purchased gas and in terms of flexibility and economy of operation—and hence is in the ultimate interest of their customers."

Pleasing Sign. Also encouraging to the gas and oil industries was the re-



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cent Senate confirmation of President Eisenhower's appointment of Jerome K. Kuykendall, of Olympia, Wash., formerly member of the Washington State Utilities Commission, as a member of FPC. Kuykendall was sworn in May 15 as a member of the commission, in replacement of Thomas C. Buchanan. Kuykendall was immediately thereafter named chairman of FPC by President Eisenhower. Buchanan previously was chairman.

Kuykendall had told the Senate Commerce Committee, considering his appointment, that he favored giving consideration to replacement costs in setting utility rates. His statements also indicated he would not be in favor of FPC regulation of gas sales by independent operators. For his testimony appeared to satisfy Senator Schoeppel (R-Kan.) who has strongly advocated exemption of gas sales by independent operators from FPC control. Kuykendall told the senators that he opposed attempts of government agencies to stretch or distort the intent of Congress.

Though they deprecate the FPC policy penalizing gas company ownership of production, some of the gas transmission companies are increasing their production activities in the hope that the FPC rules eventually may be changed. This attitude was expressed by El Paso Natural Gas Company, for example, in its annual report for 1952. The company's affiliate, Western Natural Gas Company, is actively proceeding with development of gas production, as previously stated.

"The present rules of the FPC do not permit the company to profit by the discovery and development of gas reserves to the same extent as other producers not owning or affiliated with an interstate pipe line system," stated El Paso Natural Gas in its annual report. But "the company believes that such rules may in time, in the public interest, be modified.

"The consumers' interest, as well as the interest of the stockholders and other security holders of the pipe line company can best be served by the ownership of substantial reserves by the pipe line company," the report declared. "With such ownership, the pipe line company becomes properly integrated. By its contracts with the distributors and its certificates from the Federal Power Commission, it has the market. Through its own investments, it has provided the transportation facilities to supply such market. The company is convinced that, in order properly to safeguard its markets and its capital investments, the pipe line company should have a substantial amount of reserves owned and developed by it."

Production Retarded. Production and use of natural gas have been greatly retarded by the threat of FPC regulation of all producers furnishing gas to interstate pipe lines. Sales of gas for movement into the interstate lines will be further discouraged as a result of the May 22, 1953, decision of the U. S. Court of Appeals for the District of Columbia at Washington in the Phillips Petroleum Company gas sales case.

By 2-to-1 decision, the court overruled the FPC finding, following a lengthy hearing, that Phillips was exempt from FPC regulation and price fixing powers. The court held that Phillips was selling gas for interstate transportation and resale; that Phillips "is a 'natural gas company' within the meaning of the Natural Gas Act; and the commission should fix the rates at which these sales are made."

Apparently, any independent producer would be similarly subject to FPC utility type regulation, under this new decision. However, it is fairly certain that the case will be further appealed to the U. S. Supreme Court. But after the Court of Appeals decision it was pointed out that the Supreme Court would soon end its current session and that it probably would not consider this case until next year.

FPC had declared in its ruling in the Phillips case that the Natural Gas Act of 1938 specifically exempts from FPC control the producers and gatherers of gas who limit their activities to production and gathering and arm's length sales of gas and do not engage in interstate transportation of the gas. FPC held that Phillips came within this exemption; that it only produced, gathered, and sold gas at arm's length and not in interstate commerce; that Phillips therefore was not a "natural gas company," subject to FPC regulation of prices of gas sold.

The majority opinion in the court decision was signed by Circuit Judges Edgerton and Prettyman. They held that Phillips' sales to the pipe line companies were not strictly within the production and gathering phases of the gas business and actually represented interstate sales of gas by the corporation that produced and gathered it.

Judge Clark dissented. He supported the stand of FPC in a dissenting opinion. He declared that "sales by a gatherer are a part of gathering so long as they are made before the gas enters the transmission lines proper . . . A finding was made by the commission in this case that the gas was sold while it was still in the gathering lines."

The suit seeking to require FPC to fix prices of gas sold by Phillips was brought by a group of state and city governments, including the State of Wisconsin, Milwaukee, Kansas City, Detroit, and Wayne County, Michigan. Intervening on the side of FPC are Phillips and the States of Oklahoma, Texas and New Mexico.

It is indicated that there will not be much effort in Congress to enact legislation this year spelling out exemption of independent producers and gatherers from FPC regulation. Such legislation probably would not be seriously considered pending appeal of the Phillips case to the U. S. Supreme Court. H. R. 2120, a bill by Representative Lyle (D-Texas), was introduced early this year but has not been pushed. It is similar to the Kerr bill, which was passed by Congress but vetoed by former President Truman.

Men of both the gas and oil industries declare that development and use of natural gas will be very seriously retarded if the decision by the U. S. Court of Appeals, overruling FPC in the Phillips case, is upheld by the U. S. Supreme Court, and if Congress does not then amend the Natural Gas Act definitely exempting producers from FPC regulation.

Besides the Lyle bill, several other bills have been introduced in Congress to exempt production and arm's length sales of gas from FPC control. Also, bills have been introduced proposing to require FPC to consider the market value of a pipe line company's own gas production in rate making.

These bills, seeking to exempt production from FPC control and to require FPC to put fair evaluation on a gas transmission company's own production, offer encouragement to the gas and oil industries. Such legislation would remove the two principal barriers to maximum development and utilization of natural gas.—**The End.**

More Progress Made Toward Offshore Oil Development

DEVELOPMENT OF OIL and gas on the U. S. Continental Shelf is being gradually advanced, along legislative, technological and operational fronts.

Congress is working on additional legislation to cover the federal portions of the Shelf after having passed the quitclaim bill that recognized states' ownership of the submerged lands within their traditional boundaries. The state governments are working out plans for further leasing of their offshore areas. Oil companies are studying the whole situation, laying out their individual programs, reconditioning equipment, considering land and leasing problems, and doing other preliminary work in preparation for future operations. Concerns supplying equipment and services for offshore development are seeking future business.

NPC Report. Contributing a great volume of information on the possibilities and problems of Continental Shelf oil and gas development is the lately issued report of the National Petroleum Council entitled "Submerged Lands Productive Capacity." The report covers an oil industry study made at request of the federal government in connection with national defense. Purpose of the study was to determine problems incident to the discovery, development, and production of offshore petroleum deposits and an estimate of availability of production that might be developed from submerged offshore lands over a period of five years.

The NPC report has been made into a paper-bound book, including the full text of the main report of the committee and also the reports of the California and Gulf Coast subcommittees. The 64-page California subcommittee report covers regional geologic setting, problems and costs involved in offshore exploration, description of offshore area, drilling, operational and production problems, also a regional map of a portion of the California coast line and adjacent islands, showing contours of ocean floor at various water depths.

The Gulf Coast subcommittee report contains 43 pages of text, five maps, six tables and nine pictures. The text deals with the Gulf Coast Continental Shelf, the general geology of the Gulf Coastal Plain between the Mississippi Delta and the Rio Grande; its stratigraphy, regional structure and structures controlling accumulation and classification of structures. The subsection further describes offshore exploratory and geophysical operations, wildcat drilling capital investments, operating conditions, operating costs, and a summary of wildcat drilling costs. Another section deals with offshore development operations, related capital investments, and a summary of estimated costs.

Copies of the full report are available from NPC headquarters, 601 Commonwealth Building, 1625 K Street, N. W., Washington 6, D. C. for $1.50 per copy, postage paid.

Federal Leasing Bills. At the middle of June, efforts were being made in the Senate toward passage of Senate bill S. 1901, for leasing and development of the federally-owned outer submerged lands of the Continental Shelf.

The House of Representatives already had passed its bill for developing the federal areas. On May 13 it had approved and sent to the Senate H. R. 5134. That bill would validate federal control of the outer portion of the Continental Shelf and permit the secretary of interior to issue oil and gas leases on those lands.

Texas to Sell Leases. Sale of some oil and gas leases, well within the recognized state boundary, will be made in December by the School Land Board of Texas. Areas adjacent to the state-federal boundary, three leagues from low tide, will not be offered at that time, to avoid possibility of a boundary dispute.

The Big Moment . . .

for FRANK W. ABRAMS

A PAIR OF SHINY, high leather boots, symbolizing the adventurous life of a civil engineer, led to The Big Moment for Frank W. Abrams, Chairman of the Board of the Standard Oil Company (New Jersey).

"As a young man," he recalls, "I wanted to become a civil engineer and some of the reasons were highly romantic. For one thing, I had yearned to wear high leather boots! They had a strong theatrical appearance and a young man is apt to value very highly anything that he thinks will add to his romantic appeal."

Frank W. Abrams

But Frank Abrams never got to wear the boots of a civil engineer. To be sure, the desire did lead to a degree in civil engineering. But as graduation approached, he found himself looking for a job. Paradoxically "The Big Moment" came when he could not find one in his chosen profession. Jobs were scarce for professional graduates in 1912, and he took the one he could get, which was with the Jersey Standard company.

Occasionally he reflects on how the course of a life may be changed by such relatively small incidents. Today, in retrospect, he realizes that "The Big Moment" that placed him in a growing company in a dynamic industry was a matter of plain good luck; a turn of fortune's wheel that at the time appeared in the form of a mild disappointment that he would not have a chance to wear the high leather boots.

Arabian American Is World's Largest Oil Producing Company

The distinction of being the largest oil producing company in the world in 1952 goes to Arabian American Oil Company. It produced 301,860,-885 barrels, an average of 824,756 barrels per day, all in Saudi Arabia.

That was gross production, with the Arabian government sharing in company profits in lieu of royalties. The company anticipates that the 1952 production may not be equaled in 1953, because of a flattening out of the rising trend of world oil consumption and the possibility of a resumption of crude production in Iran.

Arabian American Oil Company is owned jointly by four American companies—Standard Oil Company of California, The Texas Company, and Standard Oil Company (New Jersey), each holding 30 percent, and Socony-Vacuum Oil Company, with 10 percent.

• The second largest producing company in the world is Creole Petroleum Corporation, 93 percent of which is owned by Standard of New Jersey. Creole in 1952 had gross production of 804,000 barrels daily or net production of 668,000 barrels daily.

• Largest producing company in the U. S. is Humble Oil & Refining Company, of which 72 percent is owned by Standard of New Jersey. In 1952 Humble had gross production of 405,000 barrels daily or net production of 350,000 daily.

The above figures deal only with individual corporations that actually carry on oil production operations. From the standpoint of ownership, the company that has the greatest amount of production in the world is Standard Oil Company (New Jersey). During 1952 all Jersey affiliates had gross crude oil production averaging 1,790,000 barrels or net production averaging 1,559,000 barrels per day. These figures include only Standard's share of the production of companies in which it does not have majority interest, such as Arabian American, Iraq Petroleum Company, Standard-Vacuum Oil Company, and other companies in the Eastern Hemisphere; but it includes all the production of wholly owned and controlled subsidiaries, such as Carter Oil Company, Imperial Oil Limited, International Petroleum Company, Creole, and Humble.

Pipe Line for Coal Is in the Offing

Coal may gain some advantage in its competition with oil and natural gas by going through pipe lines to market.

Following several years of experimentation, a major coal producing company contemplates building a 110-mile coal pipe line from southeastern Ohio to Lake Erie.

The line would supply coal to electricity generating plants in Detroit, Cleveland, Buffalo, and other points. The coal would be crushed finely, mixed with water, pumped through the line, removed, and dried. This piping of coal is believed to offer economies as compared with movement by railroad.

Middle-East Gets a Shot in the Arm

Middle East oil development will be increased by the governments of Turkey and Israel encouraging drilling by American, British-Dutch, and other private companies.

Turkey has granted exploration permits to several major companies and is having Max W. Ball, American oil and gas consultant, draft a new petroleum law for presentation to the Turkish national assembly when it convenes in November. The aim of the proposed new law is to stimulate oil development by experienced and well-financed foreign oil companies.

American, Canadian, and other interests are going ahead with oil development plans in Israel, and several wells are expected to be drilling there later this year.

API for Europe Is Asked by Dwyer

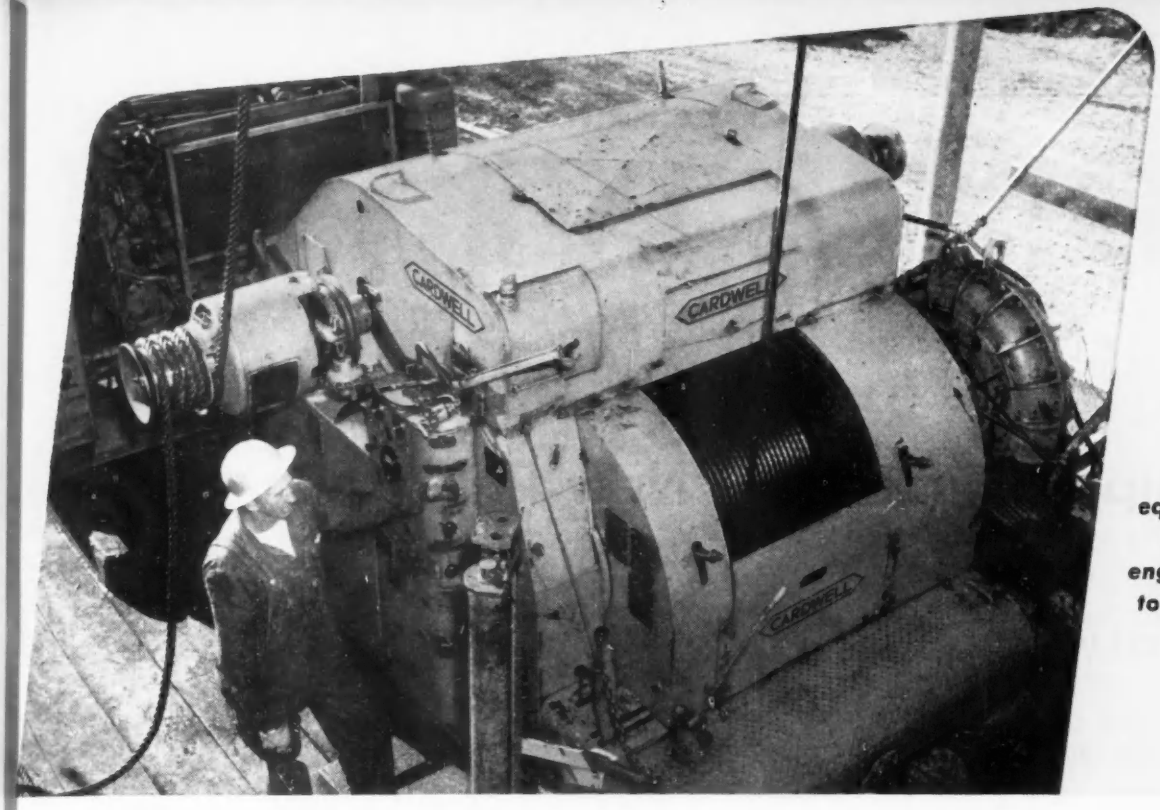
Organization of a European Petroleum Institute, similar to the American Petroleum Institute, is advocated by Cornelius J. Dwyer, head of the petroleum division of the Mutual Security Agency. The proposed EPI would have as a principal purpose that of making the people of Europe realize the importance of the petroleum and related industries to the European economy.

There is at present no existing organization to carry the petroleum industry's story to the people, Dwyer said.

Among the benefits of an EPI, he indicated, might be some elimination of barriers to inter-Europe trade in oil, discouragement of internal quota arrangements and restrictions on imports, and removal of other restrictions that promote inefficient operations and curtail oil consumption.

OW's Wanted

The Texas Engineers Library at Texas A & M College, College Station, Texas, would like to receive, as a gift, volumes, of *The Oil Weekly* from its founding in 1916 to 1930.



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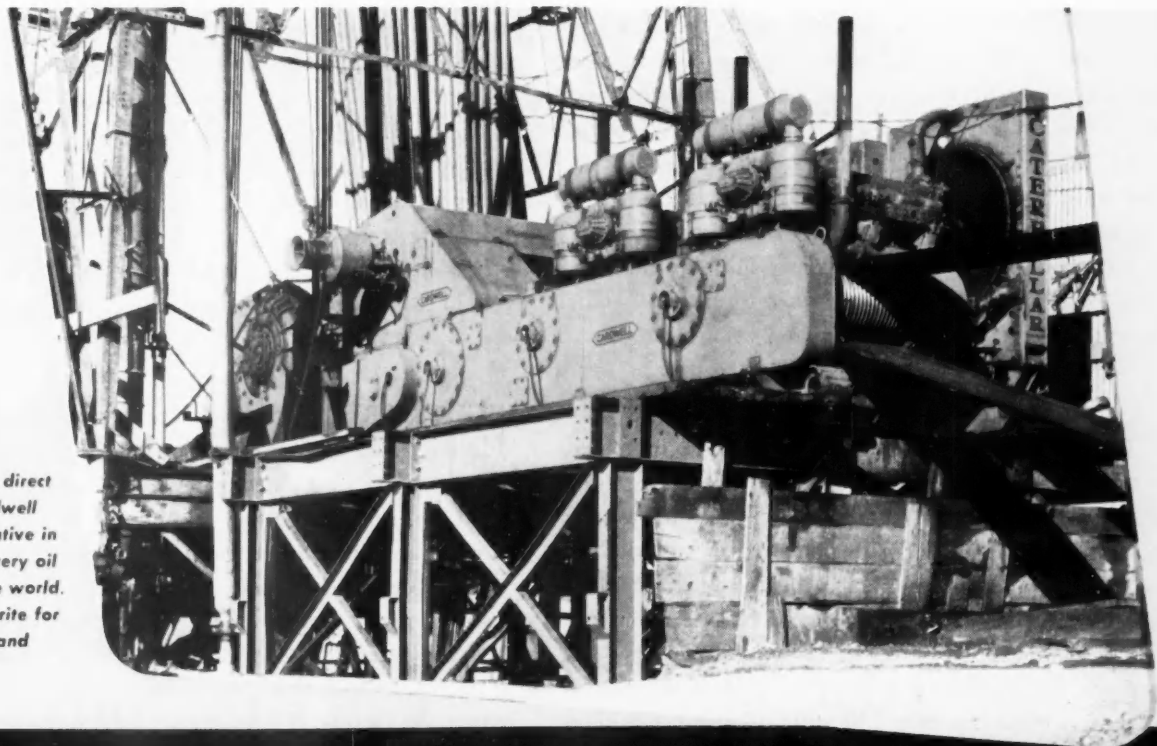

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By **RAY L. DUDLEY,** Publisher, and **WARREN L. BAKER,** Editor

High Supply Endangers New Prices

HIGHER U. S. CRUDE PRICES posted in mid-June provide the industry with an opportunity to improve its economic position, but at the same time could prove damaging in the long run if supply is encouraged to get out of hand.

The first general crude price advance since December, 1947, came as a surprise to many. Although long overdue and badly needed to offset greatly enlarged drilling and operating costs, more than ample supplies did not indicate higher postings were likely at this time. A sizeable segment fears there is not more than a 50-50 chance that the increased prices will stick through next spring. This will depend upon the future levels of production, imports and refining activity.

Now, more than at any previous time this year, it behooves both producers and refiners to exercise extreme caution. It would be a mistake to boost producing and refining rates at this time. Supply is so close to being excessive that even the relatively small 28,500 barrel-per-day raise in Texas' July allowable is not helpful. The present situation dictates that supply needs to be held to moderate levels through September. This would give seasonal gains in consumption a chance to draw off some of the excess stocks of both crude and refined products.

•

THE INCREASE came although supply has increased more than demand so far this year. During the first five months of 1953, U. S. production of crude and natural gas liquids has been 6.2 percent above the corresponding period of 1952, and crude imports have been 24.3 percent higher. In contrast, indicated demand has risen but 5.9 percent over year ago rates.

As a result, stocks are on the excessive side. Crude stocks June 6 totaled nearly 278 million barrels, 6 million barrels greater than at the beginning of the year. Crude inventories have increased despite refinery runs being near peak levels attained in the latter part of 1952, as the industry strived to make up losses incurred during the refinery strike in May of that year.

Early June refinery runs were especially high and resulted in record gasoline and distillate production. Consequently, gasoline inventories have not decreased as rapidly as usual for this season of the year and distillate stocks have been growing faster than normally expected. If this situation is not corrected, the industry will enter the winter months with both too much gasoline and distillate fuel in storage tanks.

•

HIGHER REVENUE RATES, on one hand, should encourage producers to be content to produce smaller quantities of oil. On the other hand, there is danger producers may interpret higher prices as a signal the market is strong and that their enthusiasm will lead to excessive producing rates. This would be disastrous.

Larger production from stripper wells is likely, higher prices encouraging operators to restore shut-in wells to producing status.

Higher U. S. prices also may encourage the importation of larger amounts of foreign crude and products.

•

HIGHER CRUDE PRICES were greatly needed by the industry. Cost of finding, developing and producing oil is much greater today than at the end of 1947. Increased prices will encourage the drilling of a greater number of wells and thus boost the nation's discovery rates.

These conditions make the need for increased crude prices so great, it is to be hoped they can be maintained. This will depend, as previously pointed out, upon whether producing, importing and refining rates are held to reasonable levels. During the July-September period, anything above June levels could prove excessive, endangering the industry's chances of long enjoying the new crude price postings.

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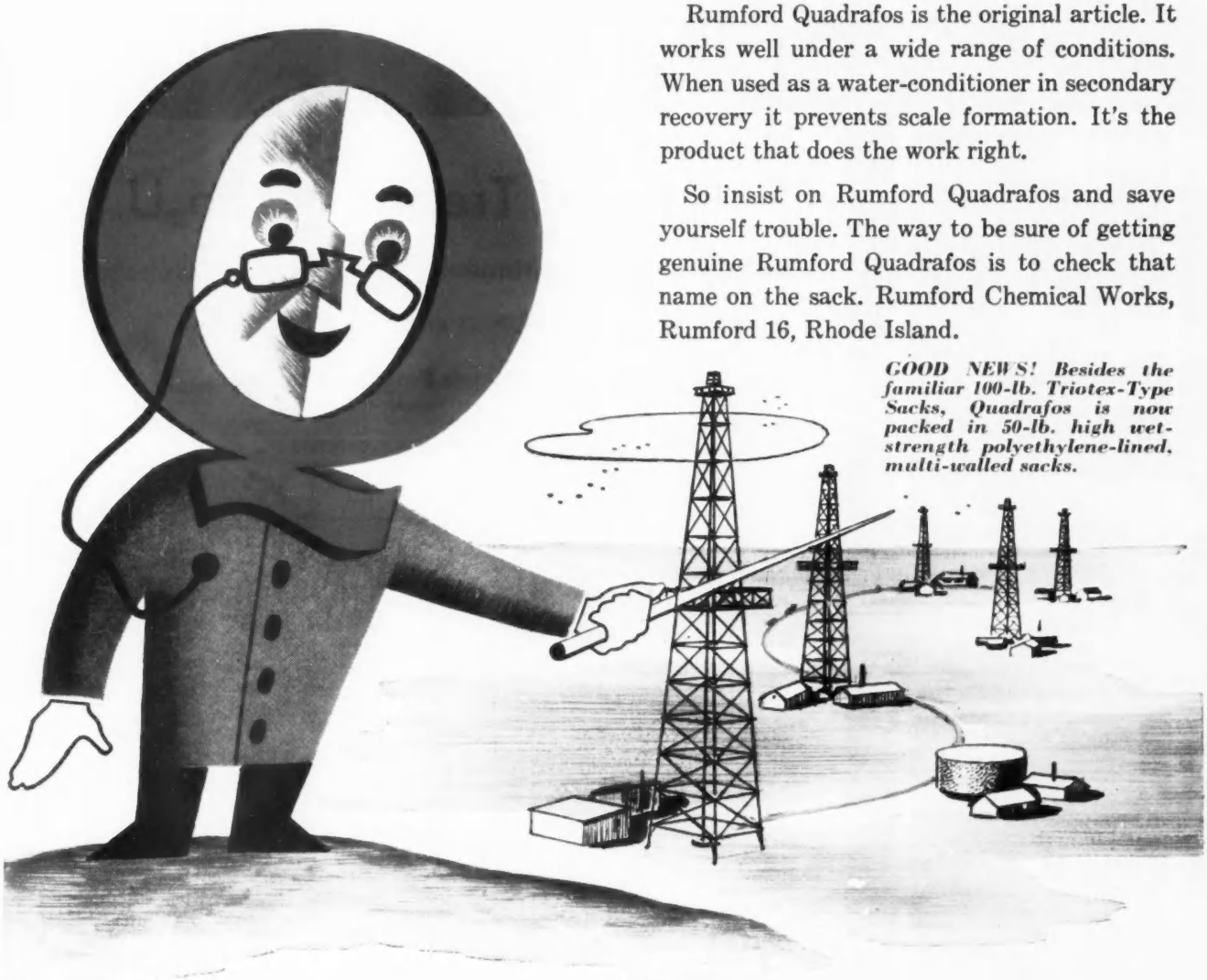

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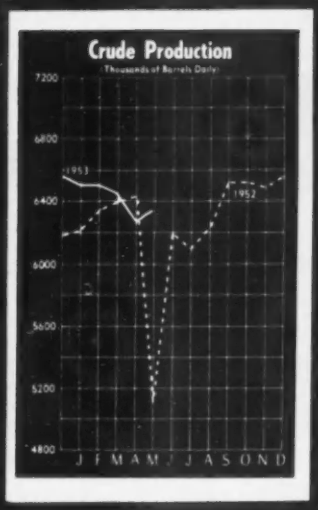
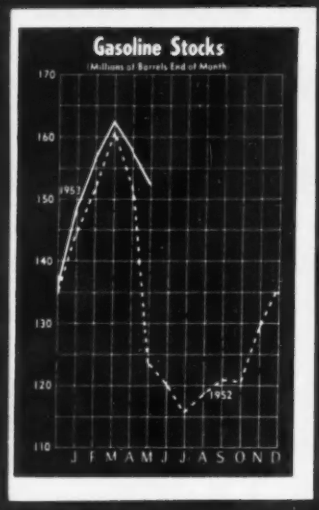
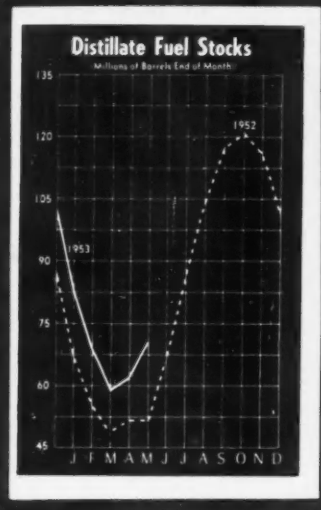
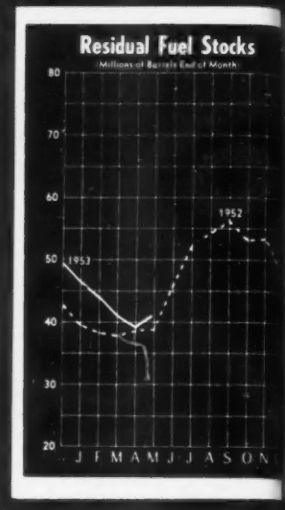
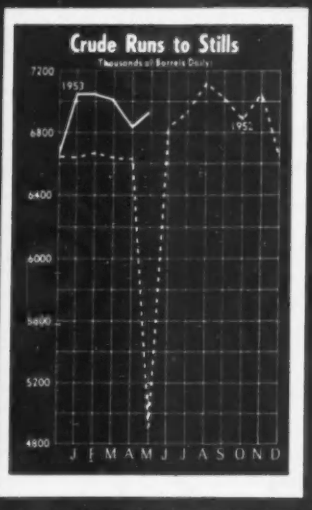
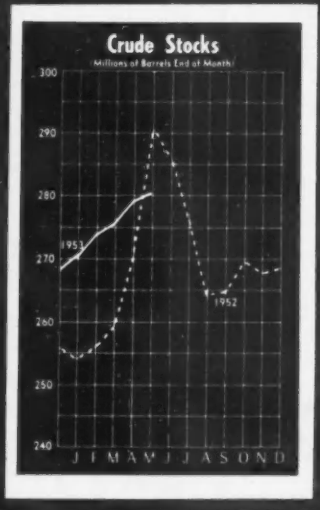












Petroleum Trends in the U. S.

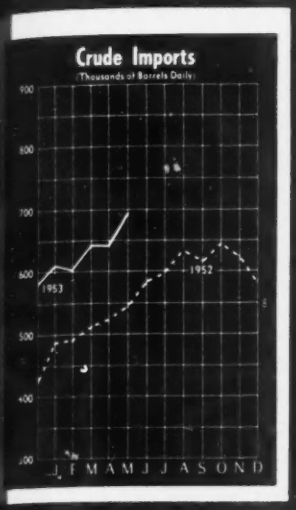
drilling activity continues to climb . . .

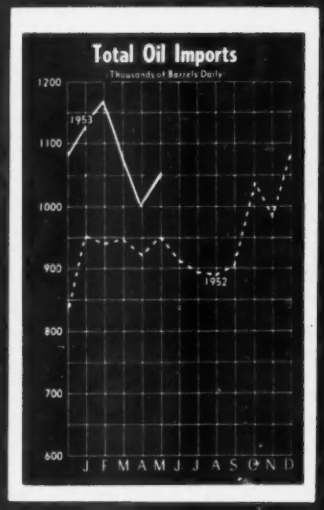
By CECIL W. SMITH, WORLD OIL Staff

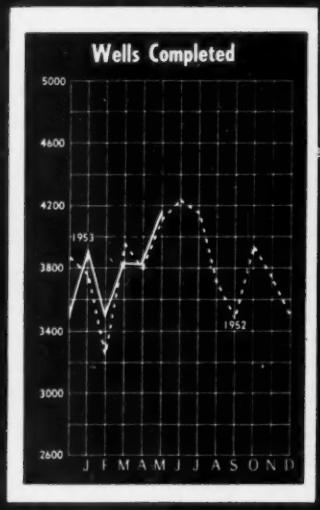
U. S. Crude Production by States

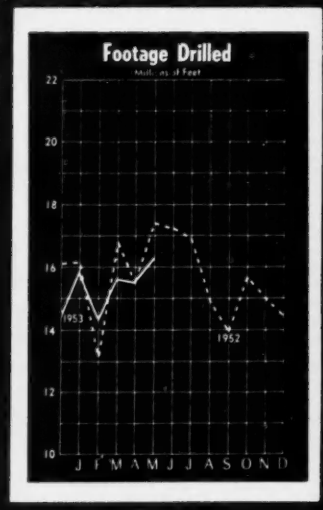
(Thousands of Barrels)

STATE or DISTRICT	DAILY AVERAGE PRODUCTION				TOTAL PRODUCTION First Five Months		
	May, 1953	April, 1953	May, 1952	% Diff. May '52-'53	1953	1952	% Diff '52-'53
Alabama	4.8	4.5	2.4	+100.0	697	390	+ 6.2
Arkansas	77.5	77.9	78.4	— 1.2	12,046	12,337	— 4.
California	1,003.3	997.3	988.8	+ 1.5	150,360	148,790	+ 0.
Colorado	97.5	93.5	66.5	+ 46.6	13,146	11,677	+ 12.
Florida	1.5	1.5	1.7	— 11.8	223	260	— 12.
Illinois	162.5	164.0	150.7	+ 7.8	24,402	23,836	+ 2.
Indiana	35.4	35.4	31.5	+ 12.4	5,393	4,690	+ 11.
Kansas	324.0	326.6	160.5	+101.9	50,117	44,680	+ 11.
Kentucky	29.9	29.8	33.6	— 11.0	4,553	5,309	— 15.
Louisiana	700.7	693.3	579.6	+ 20.9	106,438	96,907	+ 9.
North Louisiana	113.3	115.2	115.3	— 1.7	17,634	18,059	— 4.
South Louisiana	587.4	578.1	464.3	+ 26.5	88,804	78,848	+ 12.
Michigan	34.2	34.1	36.1	— 5.3	5,144	5,559	— 6.
Mississippi	98.2	97.1	101.4	— 3.2	14,948	15,200	— 1.
Missouri	0.1	0.1	0.1	.....	8	10	— 20.
Montana	34.9	31.6	22.6	+ 54.4	4,680	3,644	+ 31.
Nebraska	13.6	12.9	3.3	+312.1	2,162	780	+ 146.
New Mexico	187.5	182.9	88.5	+111.9	27,728	22,475	+ 21.
New York	12.6	12.7	11.9	+ 5.9	1,743	1,784	— 8.
North Dakota	14.5	12.9	1.7	+752.9	2,186	118	+1736.
Ohio	9.7	9.2	8.3	+ 16.9	1,378	1,295	+ 6.
Oklahoma	532.7	544.7	398.9	+ 33.5	82,961	77,306	+ 4.
Pennsylvania	28.0	28.3	31.6	— 11.4	4,363	4,710	— 9.
Tennessee	.....	.....	.....	.....	5	5	.....
Texas	2,716.4	2,669.1	2,163.1	+ 25.6	425,918	416,307	+ 2.
Dist. 1: South Central	35.4	34.7	32.4	+ 9.3	5,471	5,028	+ 8.
Dist. 2: Middle Gulf	152.8	151.9	132.2	+ 15.6	24,040	24,214	— 0.
Dist. 3: Upper Gulf	461.6	462.0	370.8	+ 24.5	72,554	70,978	+ 2.
Dist. 4: Lower Gulf-S.W.	254.5	250.4	244.1	+ 4.3	39,109	39,523	— 1.
Dist. 5: East Central	47.2	47.0	52.9	— 10.8	7,493	8,857	— 15.
Dist. 6: Northeast	372.9	378.0	373.2	— 0.1	57,711	59,520	— 3.
Dist. 7-B: North Central	108.0	103.3	73.3	+ 47.3	16,302	12,873	+ 26.
Dist. 7-C: West Central	154.6	140.4	107.0	+ 44.5	24,997	20,171	+ 23.
Dist. 8: West	887.7	863.6	653.1	+ 35.9	138,997	140,898	— 1.
Dist. 9: North	169.0	165.6	133.6	+ 26.5	27,117	23,592	+ 14.
Dist. 10: Panhandle	72.7	72.2	77.1	— 5.7	11,279	12,424	— 9.
Utah	5.6	5.3	4.2	+ 33.3	806	635	+ 25.
Virginia	0.1	0.1	.....	.....	8	4	+ 275.
West Virginia	8.2	7.6	6.3	+ 30.2	1,115	1,084	+ 3.
Wyoming	216.0	212.0	135.1	+ 59.9	32,247	26,715	+ 18.
Total United States	6,349.4	6,284.4	5,106.8	+ 24.3	974,775	926,506	+ 4.









Crude producing and refining rates up . . .

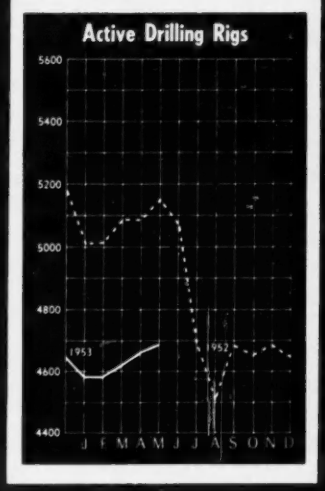
all major product stocks ahead of 1952

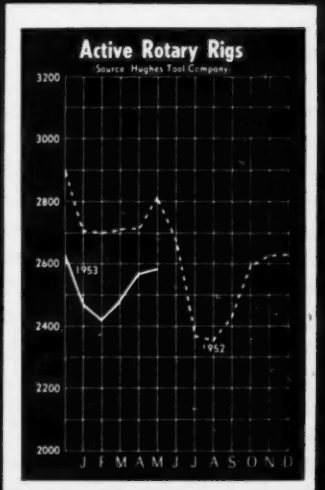
Crude Oil and Refined Products Trends

(Thousands of Barrels)

MONTH	CRUDE OIL			GASOLINE		DISTILLATE FUEL		RESIDUAL FUEL		DAILY IMPORTS	
	Production Daily	Runs to Stills Daily	Stocks End of Month	Production Daily	Stocks End of Month	Production Daily	Stocks End of Month	Production Daily	Stocks End of Month	Crude Oil	Total Oils
1951:											
April	6,127	6,183	243,180	2,821	147,679	1,171	48,239	1,230	37,623	511	871
May	6,170	6,436	248,418	3,031	141,658	1,210	59,272	1,265	39,879	518	876
June	6,130	6,575	248,170	3,100	137,000	1,254	72,140	1,277	42,398	563	876
July	6,141	6,462	250,847	3,091	130,931	1,228	84,282	1,275	46,320	546	788
August	6,232	6,539	254,276	3,114	124,202	1,237	94,028	1,226	48,365	529	780
September	6,261	6,558	254,900	3,127	124,530	1,282	104,082	1,228	49,608	500	744
October	6,375	6,446	262,266	3,105	118,864	1,295	109,544	1,224	49,573	421	769
November	6,272	6,609	261,100	3,130	122,723	1,358	101,666	1,304	46,491	425	802
December	6,182	6,646	255,783	3,150	134,867	1,442	86,619	1,313	42,853	423	834
1952:											
January	6,217	6,640	254,007	3,094	144,339	1,456	66,969	1,338	39,523	488	951
February	6,367	6,673	255,900	3,109	151,912	1,528	55,369	1,322	38,295	491	940
March	6,388	6,640	259,126	3,069	160,689	1,400	48,750	1,274	37,971	510	947
April	6,429	6,435	270,679	2,995	151,890	1,312	51,634	1,253	38,561	539	922
May	5,107	4,905	290,813	2,295	123,656	982	51,648	979	38,821	545	951
June	6,197	6,825	285,964	3,169	120,166	1,455	65,911	1,228	45,688	581	911
July	6,093	6,927	275,951	3,296	116,566	1,475	85,775	1,237	52,245	597	892
August	6,219	7,118	264,368	3,377	118,592	1,514	104,257	1,252	54,061	632	879
September	6,518	7,017	264,723	3,428	120,991	1,502	117,252	1,230	56,200	615	932
October	6,518	6,883	269,776	3,301	120,062	1,458	120,721	1,203	53,052	643	1,037
November	6,487	7,049	267,852	3,416	129,509	1,510	116,096	1,299	53,069	624	984
December	6,634	6,952	271,928	3,361	136,028	1,509	99,582	1,302	48,706	603	1,165
1953:											
January	6,555	7,042	272,250	3,384	150,518	1,528	80,655	1,307	45,910	616	1,135
February	6,562	6,969	273,589	3,379	157,873	1,505	67,167	1,275	44,178	586	1,066
March	6,531	7,002	275,665	3,319	162,731	1,489	59,802	1,256	41,600	655	1,112
April	6,284	6,804	279,187	3,262	157,711	1,401	61,037	1,241	39,002	637	996
May	6,349	6,952	280,285	3,321	152,457	1,383	71,695	1,228	41,572	693	1,054
May, 1953 Change											
In Month	+65	+148	+1,076	+59	−5,254	−18	+10,658	−13	+2,570	+56	+58
In Year	+1,242	+2,047	−10,528	+1,026	+28,801	+401	+20,047	+249	+2,751	+148	+103
Week Ended:											
6-13-53	6,477	7,026	278,960	3,459	150,757	1,427	79,579	1,229	43,595	694	1,065
6-14-52	6,149	6,672	284,906	3,115	121,993	1,471	57,944	1,288	40,889	614	869

Source: Data for last two months from API; prior monthly data from Bureau of Mines.





Raise Puts Crude Postings Above Levels of Price Control Period

Crude oil prices in Mid-Continent, Rocky Mountain, and Middle West fields were increased an average of about 25 cents a barrel as of June 15. Those raises put postings throughout the nation on levels above those that prevailed when price controls were ended in early 1953.

(On February 16, 1953, Pennsylvania grade crude was raised 15 cents a barrel to $4.40 in the case of Bradford crude. On the same date California crude prices were raised varying amounts depending on gravity, with Signal Hill 27-27.9 gravity, a representative California crude, advanced 35 cents to $2.76 per barrel.)

The Mid-Continent raise put Oklahoma, Kansas, North Texas and West Texas sweet crudes of 36-36.9 gravity up to $2.82 per barrel from $2.57. East Texas field crude was raised to $2.90 per barrel from $2.65. New Mexico, West Texas, and Panhandle crudes were raised 25 cents a barrel. So were crudes in Colorado, Wyoming, and other Rocky Mountain areas. Louisiana, Mississippi and Arkansas crudes also were raised generally by 25 cents a barrel. The new price for Illinois Basin crude is $3.02 per barrel.

Certain fields of the Gulf Coast of Texas and Louisiana were given increases better than the average 25-cents raise. Anahuac, Refugio, Sweden, Imogene, Conroe and Tomball grades were increased 30 cents a barrel by Humble Oil & Refining Company, while low cold test Coastal, Hastings, and Mirando grades were raised 35 cents. These raises were met by other purchasers, and similar increases were extended to some South Louisiana fields. In Texas, Hawkins-Talco and Pearsall grades heavy oils were increased 10 cents a barrel.

The higher prices for the Mid-Continent, Rocky Mountains and Mid-West were initiated in a surprise move June 15 by Phillips Petroleum Company, which is said to purchase from other producers about one third of its refinery requirements of crude.

Humble Follows. That the Phillips increase would become general was fairly well assured within a short time when similar though somewhat different raises were posted, effective June 15, by Humble Oil & Refining Company, largest purchaser of Texas crudes and prominent buyer also in New Mexico. The new Humble prices were soon met by competing purchasers, including Gulf Oil Corporation, Continental Oil Company, Standard Oil Company (Indiana), and others. Those raises were met, in turn, by other purchasers and were extended throughout the Mid-Continent, Rocky Mountains, and Mid-West. Ultimately, the raise of about 25 cents had been met by virtually all purchasers, including Pure Oil Company, Cities Service Company, Carter Oil Company, Mid-Continent Petroleum Company, The Texas Company, Shell Oil Company, Esso Standard Oil Company, Magnolia Petroleum Company, Sun Oil Company, and others.

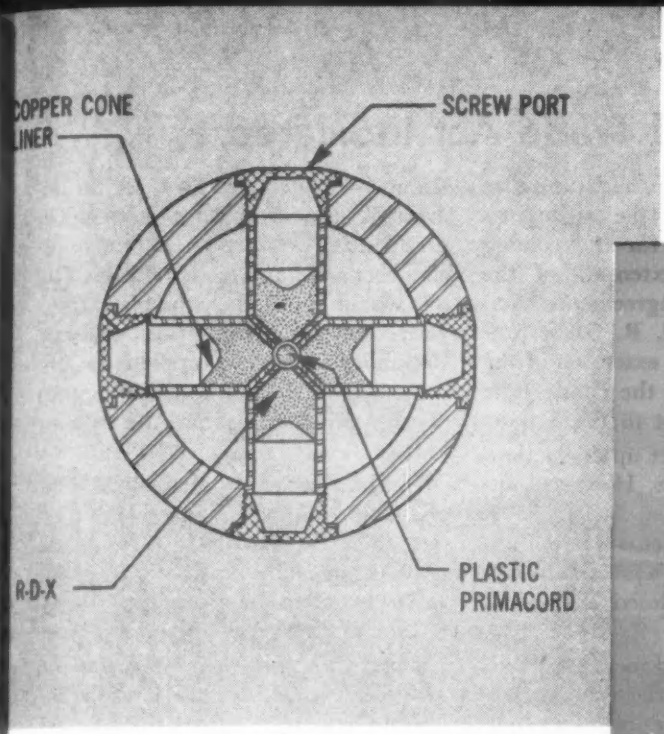
The Mid-Continent raise was the first general advance since December, 1947, 5½ years ago. In September, 1948, Phillips Petroleum Company raised its prices generally 35 cents a barrel. But Sinclair Oil Corporation was the only other major purchaser to meet the Phillips postings, and both of those companies lowered their postings back to the old general levels in December, 1948. Markets were weak in 1949 because of the general business letdown and oversupplies of oils. They strengthened in late 1950 after the outbreak of the Korean conflict. Then prices of crude and products were frozen by the government on Jan. 25, 1951, and price controls were not lifted until early 1953.

Closely related to the recent general crude price increase was the relatively tight market for gasoline and other refined products. In recent weeks a very firm market for gasoline has prevailed, with supplies relatively tight and refinery prices edging upward at refineries on the Gulf Coast. Because of the higher prices asked by refiners, Socony-Vacuum Oil Company on June 10 initiated increases up to 7/10 cents per gallon in tank wagon prices for gasoline in the New York and New England areas. Those increases subsequently were adopted also by other marketers.

Down the Line. Following the crude price increase, it was indicated that compensating advances would be made generally in product prices at the refineries and also in tank wagon and retail prices. Independent refiners generally declared they would have to get more for their products in order to pay more for crude. It appeared that refiners would seek ¾ to 1 cent per gallon more for gasoline, ⅜ to ¾ cent more for distillate fuel oil, and 20 to 25 cents a barrel more for residual fuel oil. In view of the expected higher prices generally at the refinery docks, it was indicated that gasoline tank wagon prices would have to be advanced ¾ to 1 cent per gallon and that service stations would have to raise the retail price about 1 cent a gallon.

As this is the off-season for heating oil and refiners would like to move summer production of that product into the hands of resellers and consumers, the current readjustments probably will have much less buoying effect on heating oil prices than on prices of gasoline. The heavy consuming season for gasoline is now under way, and strong demand would bolster new, slightly higher gasoline prices.

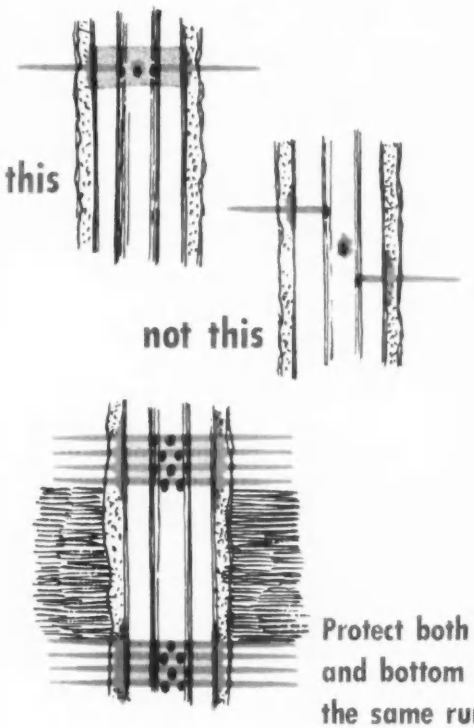
While the "trigger" setting off the crude raise apparently was the relatively tight market for gasoline, the gasoline situation in turn reflected deeper, fundamental factors of more complex nature. Refiners see demand for petroleum products constantly ex-



The diagram above shows the charge arrangement in the "4-Way" gun.

WATER-PROOFING

the pay zone with Lane-Wells new "4-way" gun



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panding and want assurance that they will have sufficient crude in the months and years ahead, as well as now. To assure the supply, they think that stronger incentive for finding and producing oil is now definitely needed in the form of the higher crude prices that were posted.

Reserves Needed. In announcing the increases, both Phillips and Humble pointed out the need for stimulation of development of crude reserves. More reserves are needed, they said, in order to meet growing demand for petroleum products and also in order to promote the development and maintenance of a substantial surplus of producing ability for meeting national emergencies and national defense needs. To stimulate oil finding development, they continued, higher crude prices now are definitely essential, as the old prices have not been sufficient to cover the increases that have occurred since 1947 in the costs of finding, developing, and producing oil.

Wholesale commodity prices generally have increased substantially, it was pointed out, and rates of pay and costs of materials used in oil production have increased more than prices generally. "The increasing proportion of deeper, more expensive wells has added to the cost of finding and developing reserves," declared K. S. Adams, chairman, and Paul Endacott, president, of Phillips Petroleum Company.

Another fact given recognition in the June 15 price readjustments was the change that has occurred in the past five years in the technology of oil refining. Those changes have influenced "the relative yields of products from different crude oils," said Hines H. Baker, president, Humble Oil & Refining Company. "Also, there has been some change up and down in the price of refined products. These changes have affected the relative values of the several grades of crude oil produced and have brought about substantial price inequalities."

The new Humble price schedule recognized these changed relative values by providing increases of different amounts for different grades of crude.

Extension of Trade Act Indicated

It appeared likely at mid-June that Congress would leave the oil imports situation unchanged for the coming year by a simple extension of the Reciprocal Trade Agreements Act. The Simpson bill, H. R. 5495, providing for a one year extension of the act, was approved by the House June 15 and then was sent to the Senate.

The bill does not set up restrictions on petroleum imports. However, another bill by Simpson, H. R. 5496, does provide for quotas on oil imports. The House Ways and Means Committee was scheduled to consider that bill June 15.

The first mentioned measure, H. R. 5495, would extend the trade agreements, increase size of the Tariff Commission from six to seven members, thus affording chance for a stronger "protection" of domestic industries, and establish a 17-member presidential commission to study foreign economic and trade policies. This bill would fulfill the administration's wishes on the foreign trade problem. Republican leaders proposed the one year extension and a careful study of the problem during the coming year.

In the Senate, Chairman Millikin (R.-Colo.) of the Finance Committee said that the proposed simple extension of the trade agreements act would be acted upon promptly by the Senate, without extended hearings.

The trade agreements act was due to expire June 12, and both houses of Congress were trying to pass the extension bill by that date or within a few days thereafter.

Iran Finds Two Buyers for Its Oil

Iran has made a little progress toward marketing nationalized petroleum. Companies in Japan and Italy are risking litigation trouble with the British, who claim the Iranian oil, in order to take advantage of the half-price sale of the oil by the Iranian government.

Both crude and products have been offered at 50 percent of regular market price to American as well as Japanese and Italian purchasers, effective for the next six months, if payment is made in dollars.

Japan's Idemitsu Kosan Company became an actual purchaser of Iranian oil in April, loading its 10,000-ton tanker Nissyo Maru with a cargo destined for Japan. Anglo-Iranian Oil Company in early May sought from Tokyo District Court an order requiring the Japanese company, headed by Sukezo Idemitsu, to hold the cargo aboard pending a higher court decision or to post bond before unloading.

However, the Tokyo Court on May 27 ruled against Anglo-Iranian Oil Company and authorized sale in Japan of the Iranian oil, which had arrived in Tokyo May 9. The district judge denied Anglo-Iranian's charge that the oil was "stolen goods." He said that Iran's oil nationalization law superseded the earlier private business agreement between the Iranian government and the Anglo-Iranian company. AIOC planned immediate filing of an appeal to a higher court.

On June 8, the same tanker arrived at Abadan for its second cargo of Iranian petroleum.

Under Japanese government foreign exchange controls, dollars henceforth will not be available for purchase of Iranian oil for shipment into Japan. However, Sukezo Idemitsu, president of the Idemitsu Kosan company, said that when he runs out of dollars for purchase of Iranian oil, he will seek Japanese government permission to import oil from Iran on a barter basis.

Several cargoes of oil have been bought from Iran by the Italian Supor Company and have been shipped successfully into Italy and marketed there. An Italian court decision permitted the marketing of a cargo of Iranian oil that had been brought to Venice. Iran then offered to sell oil to the Italian company for six months at one half the corresponding price in the world markets, in appreciation of the company's successful legal fight with Anglo-Iranian Oil Company over the right to purchase the nationalized Iranian oil. Under Italian law, AIOC could not appeal its case, but it did file new claims in a court in Rome.

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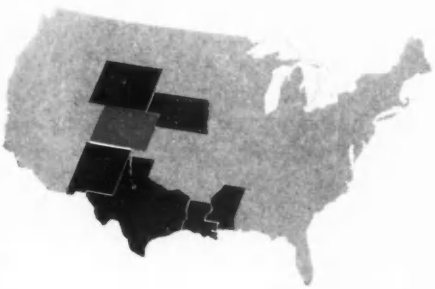

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Spraberry Ruling Hits a Legal Snag in Texas Supreme Court

Efforts of the Texas Railroad Commission to stop waste of casinghead gas in the Spraberry field of West Texas have led to difficult legal complications.

On June 10 the Texas Supreme Court issued an injunction against further enforcement of the commission's April 1 order closing down the field because of gas waste. The commission considered asking the court for a rehearing and believed it had two weeks in which to do so, before the entering of final judgment by the court; and gas-flaring wells were expected to be kept shut in until the final court action.

The commission considered several possible means of combating the gas waste under the limitations imposed by the court decision. One means considered was that of allowing production only with lower gas/oil ratios and thus curtailing the field's production. Another possibility was that of shutting down only gas-flaring wells and allowing production by non-flaring wells. However, the latter course was avoided originally because of the probability that owners of shut-down wells would attack its legality, on the grounds of being forced to submit to loss of oil and gas by drainage to adjacent wells. The gas-flaring operators might thus be able to produce their wells under court injunctions.

Injunction Issued. In the early stages of this litigation, District Judge Charles O. Betts at Austin issued an injunction permitting production from wells that were not flaring casinghead gas. The gas from those wells was being processed at plants and utilized. The Railroad Commission appealed to the Texas Supreme Court, claiming that the shutdown had to be field-wide to prevent the gas waste and assure protection of the property rights of all lease owners.

The Texas Supreme Court ruled that the Railroad Commission had broad conservation powers but could not close down non-flaring wells to prevent drainage of leases that were shut down for gas-flaring.

The conservation laws "contain no grant of power authorizing the Railroad Commission to shut down a well completely in order to protect correlative rights," stated the court opinion, written by Associate Justice Will Wilson. "The Commission has power to shut down a wasteful well and to regulate the flow from a non-wasteful well in order to protect correlative rights; but it has no power to shut down completely a non-wasteful well in order to protect correlative rights.

". . . We hold that portion of the order shutting down completely non-wasteful wells in order to protect correlative rights to be void," stated the court, "because this action is not included within the power delegated to the Railroad Commission."

Court Ruling. The court said that "the attorney general, speaking for the Railroad Commission, has asked that this order be either upheld or stricken in its entirety. Upon consideration of the entire situation, we hold this order to be such that because part must fall all must fall.

". . . The Commission has made a courageous effort to prevent waste of gas. It may be that through use of administrative devices not available to the courts, the Commission can work out its own solution, preventing further waste of gas and protecting correlative rights."

The "administrative devices" mentioned by the court but not explained were believed by some to mean the commission's powers to control the gas/oil ratios of wells to prevent waste of gas.

Safety Pays Off for Canadian Drillers

A vigorous safety program conducted by drilling contractors in Canada in cooperation with the Government of the Province of Alberta and the Universities of Alberta and Texas, has reduced a Workmen's Compensation rate in Alberta oil fields from $4.25 per $100 of payroll four years ago to $2.75. Considerable credit for the success of the program goes to the Canadian Association of Oilwell Drilling Contractors which recently held its Second Annual Safety Clinic at Banff, Canada.

Discussing the program C. A. Nabors, Association president, pointed out that four years ago, due to the rapid expansion of drilling operations in Western Canada, the industry there was plagued by poor efficiency and a sad accident experience. Through the efforts of many persons, companies, and organizations, training and safety programs were implemented to reduce the shock of absorbing vast numbers of green men into a heavy and hazardous industry. The Canadian Association of Oilwell Drilling Contractors, with the aid of the Universities already mentioned, pioneered a Supervisory Training Program within the drilling industry.

Throughout the past three years this program, together with numerous short courses, have provided much needed training in many phases of the petroleum industry. The Government of Alberta has wholeheartedly sponsored every effort to bring about better and safer working conditions within the industry. The Workmen's Compensation Board has sponsored monthly safety meetings in Edmonton and has provided an excellent operating safety clinic. At these monthly meetings, safety directors, safety engineers and other industry representatives have met with government officials to discuss in detail accidents which have occurred during the preceding month, probe for the causes of the accidents, and then recommend action to prevent their recurrence.

Besides reducing the Workmen's Compensation rate the Canadian drilling industry is benefitting from the intangible results, such as the saving of lives and promoting the health and happiness of its personnel.

Nabors told the contractors attending the Safety Clinic recently:

"Those of us in the drilling contracting business do realize and are thankful for improved operating efficiency of our rigs. By such improved operating efficiency we are saving the petroleum industry huge sums in its quest for new reserves and in exploiting the present oil and gas fields. (Because of our safety program) our equipment is cared for much better now by more experienced and more interested personnel."

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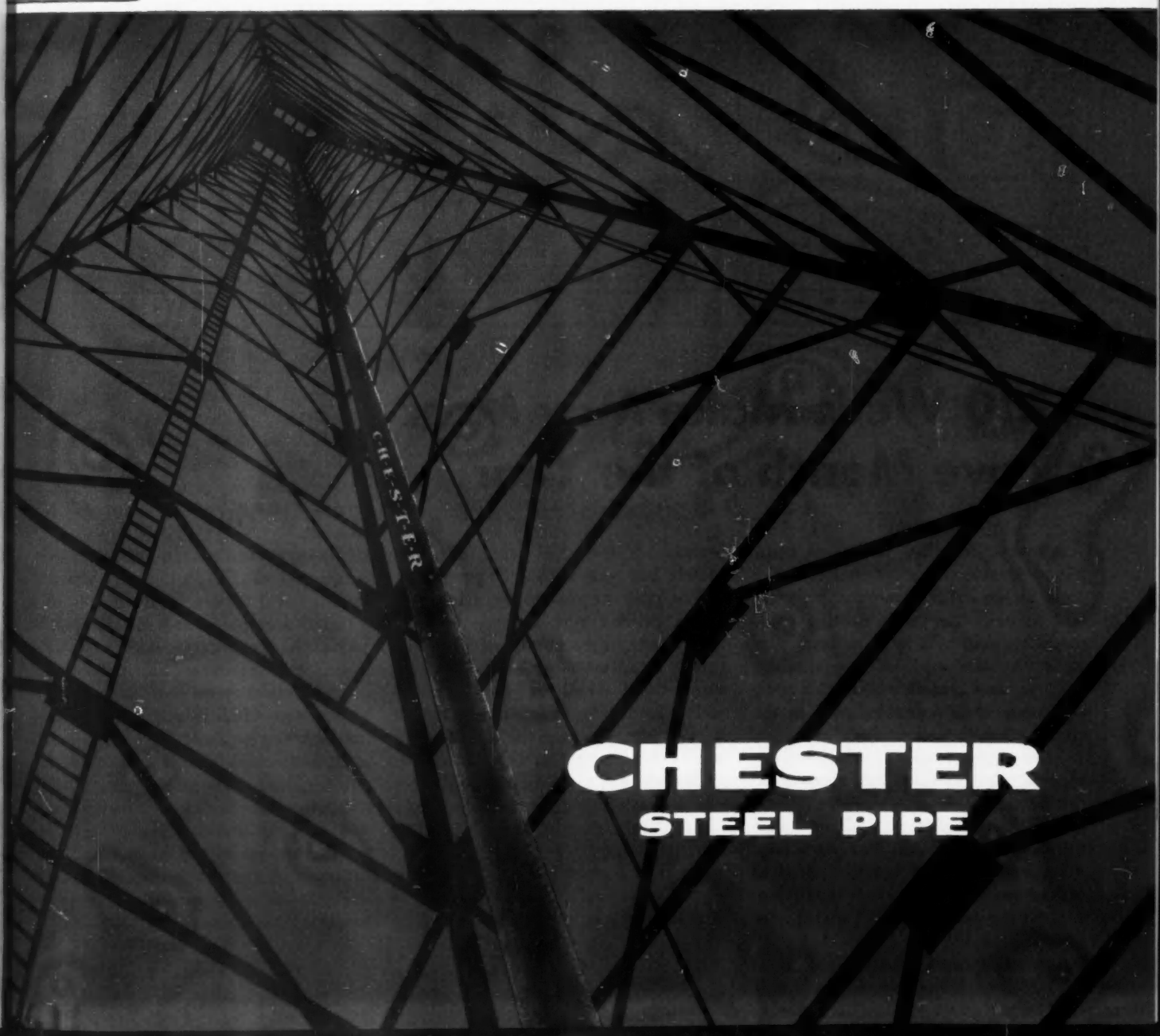


CHESTER
STEEL PIPE

● U. S. Wells Completed in May and First Five Months, 1953

State or District	MONTHLY COMPLETIONS, MAY, 1953 — NEW WELLS: Oil	Dist.	Gas	Dry	Water Input	Gas Input	Water Disposal	Total New	Total Drilled Deeper	TOTAL COMPLETIONS: May, 1953	April, 1953	May, 1952	Footage May, 1953	CUMULATIVE TOTALS January-May: Wells 1953	Wells 1952	Percent Diff.	Footage 1953	Footage 1952	Rigs in Operation (Drilling Rigging, Up and Shut Down): May 31, 1953	April 30, 1953	May 31, 1952
Alabama				7				7	1	8	7	6	38,460	40	21	+ 90.5	210,018	108,389	6	8	6
Arizona				1				1		1		1	5,142	4	1	+300.0	10,069	3,544	3	4	3
Arkansas	19		2	17				38		38	20	30	129,503	173	154	+ 12.3	613,286	558,946	28	30	43
California	151		3	46				200	4	204	216	234	915,593	1,078	1,100	— 2.0	4,482,661	4,429,978	254	259	244
Colorado	18		9	25				52	1	53	42	31	272,438	220	159	+ 38.4	1,063,400	864,163	51	42	38
Florida				2				2		2	2	3	11,121	13	4	+225.0	69,871	27,224	6	4	1
Georgia											2			3			7,808		3	3	
Idaho														1			12,720			1	1
Illinois	78			97				175		175	102	185	472,775	715	652	+ 9.7	1,831,599	1,570,953	193	173	187
Indiana	42		2	67				111		111	121	112	188,883	506	464	+ 9.1	899,960	799,932	148	140	166
Kansas	215		30	199			4	448		448	408	424	1,569,837	2,009	1,794	+ 12.0	6,958,675	6,208,097	460	454	509
Kentucky	36		15	54	1			106		106	86	130	222,584	421	453	— 7.1	833,987	922,574	92	91	101
Louisiana	86	10	21	68				185	2	187	186	171	1,369,027	971	899	+ 8.0	6,981,643	6,185,821	228	239	241
North Louisiana	25	4	6	38				73		73	68	84	242,770	399	472	— 15.5	1,448,961	1,800,203	59	44	61
South Louisiana	61	6	15	30				112	2	114	118	87	1,126,257	572	427	+ 34.0	5,532,682	4,385,618	169	195	180
Maryland											1	5		2	20	— 90.0	8,198	79,865	4	3	20
Michigan	18			35				53	1	54	37	57	142,836	226	270	— 16.3	608,865	734,852	88	91	95
Mississippi	7	1	1	19				28	1	29	34	30	189,888	148	157	— 5.7	1,033,953	1,131,922	32	25	28
Missouri	1			4				5		5	5	4	7,955	12	14	— 14.3	12,054	17,299	3	4	3
Montana	14		2	14				30	2	32	28	21	131,406	151	80	+ 88.8	707,217	237,157	49	54	62
Nebraska	10		1	14				25		25	34	13	127,476	122	74	+ 64.9	632,026	368,116	15	21	13
Nevada											4			5			5,892		2	1	1
New Mexico	38		56	13				107		107	94	122	566,363	566	478	+ 18.4	3,205,804	2,589,991	177	195	180
New York	43				29			72		72	65	95	101,166	353	375	— 5.9	493,311	522,805	108	102	117
North Carolina																					
North Dakota	18			4				22		22	15	9	167,996	97	17	+470.6	763,904	162,464	34	27	24
Ohio	52		14	41				107	2	109	70	82	220,319	397	375	+ 5.9	824,613	811,505	179	173	163
Oklahoma	411		43	251	3	2		710	21	731	519	544	2,475,347	2,969	2,409	+ 23.2	10,499,700	8,982,699	578	596	595
Oregon																					
Pennsylvania	67		7	4	58	11		147	2	149	131	153	260,597	646	677	— 4.6	1,124,393	1,153,382	259	245	269
South Dakota				1				1		1			8,393	3	1	+200.0	16,298	8,433	4	4	3
Tennessee																					5
Texas	755	34	55	549	5		1	1,399	20	1,419	1,507	1,630	6,297,597	7,020	7,971	— 11.9	31,720,364	38,190,581	1,371	1,379	1,720
Dist. 1 S. Central	33	4		39				76		76	72	63	277,283	336	290	+ 15.9	1,092,927	886,400	30	37	39
Dist. 2 Middle Gulf	19	9	8	31				67		67	79	71	440,428	327	362	— 9.7	2,004,740	2,248,851	46	52	51
Dist. 3 Upper Gulf	65	10	9	56				140	1	141	151	191	946,459	679	792	— 14.3	4,539,527	5,123,680	131	115	145
Dist. 4 L. Gulf-S.W.	64	7	19	59				149		149	151	132	806,344	787	745	+ 5.6	4,466,503	3,833,036	114	100	97
Dist. 5 E. Central	9	1	1	23				34		34	25	25	113,250	139	157	— 11.5	534,970	841,664	18	21	31
Dist. 6 Northeast	9	1	5	14				29		29	48	47	175,934	205	240	— 14.6	1,200,496	1,482,830	40	34	46
Dist. 7-B N. Cent	134		2	118				254	1	255	291	262	804,023	1,277	1,181	+ 8.1	4,096,104	3,811,408	132	128	178
Dist. 7-C W. Cent	73	1	1	39				114	5	119	138	220	563,961	613	998	— 38.6	3,009,378	5,784,645	138	150	262
Dist. 8 West	121		1	47				169	13	182	198	355	981,354	954	1,640	— 41.8	5,209,736	9,280,230	348	348	474
Dist. 9 North	207	1	2	122	5		1	338		338	308	238	1,091,811	1,506	1,308	+ 15.1	4,970,917	4,070,609	304	320	291
Dist. 10 Panhandle	21		7	1				29		29	46	26	96,750	197	258	— 23.7	595,066	827,228	70	74	106
Utah	1			4				5		5	3	3	30,241	32	25	+ 28.0	189,977	147,826	15	19	29
Virginia																					
Washington																			1	1	
West Virginia	4		52	7				63	2	65	54	39	199,680	252	243	+ 3.7	707,629	730,947	199	188	198
Wyoming	38		1	13				52		52	61	40	259,874	253	242	+ 4.5	1,248,559	1,234,720	103	85	86
Total U.S.	2,122	45	314	1,556	96	13	5	4,151	59	4,210	3,854	4,174	16,382,497	19,408	19,129	+ 1.5	77,778,454	78,784,185	4,693	4,661	5,151
Total W. Canada	39		9	44				92		92	128	155	426,557	723	648	+ 11.6	3,050,614	2,786,177	176	166	187

4210 Wells Make May Most Active Month of the Year

A TOTAL OF 4210 wells was completed during May to make it the most active drilling month this year, and to help the year's drilling campaign to maintain its slim lead over 1952. At the end of five months, wells drilled amounted to 1.5 percent more than were recorded in the comparable period of 1952.

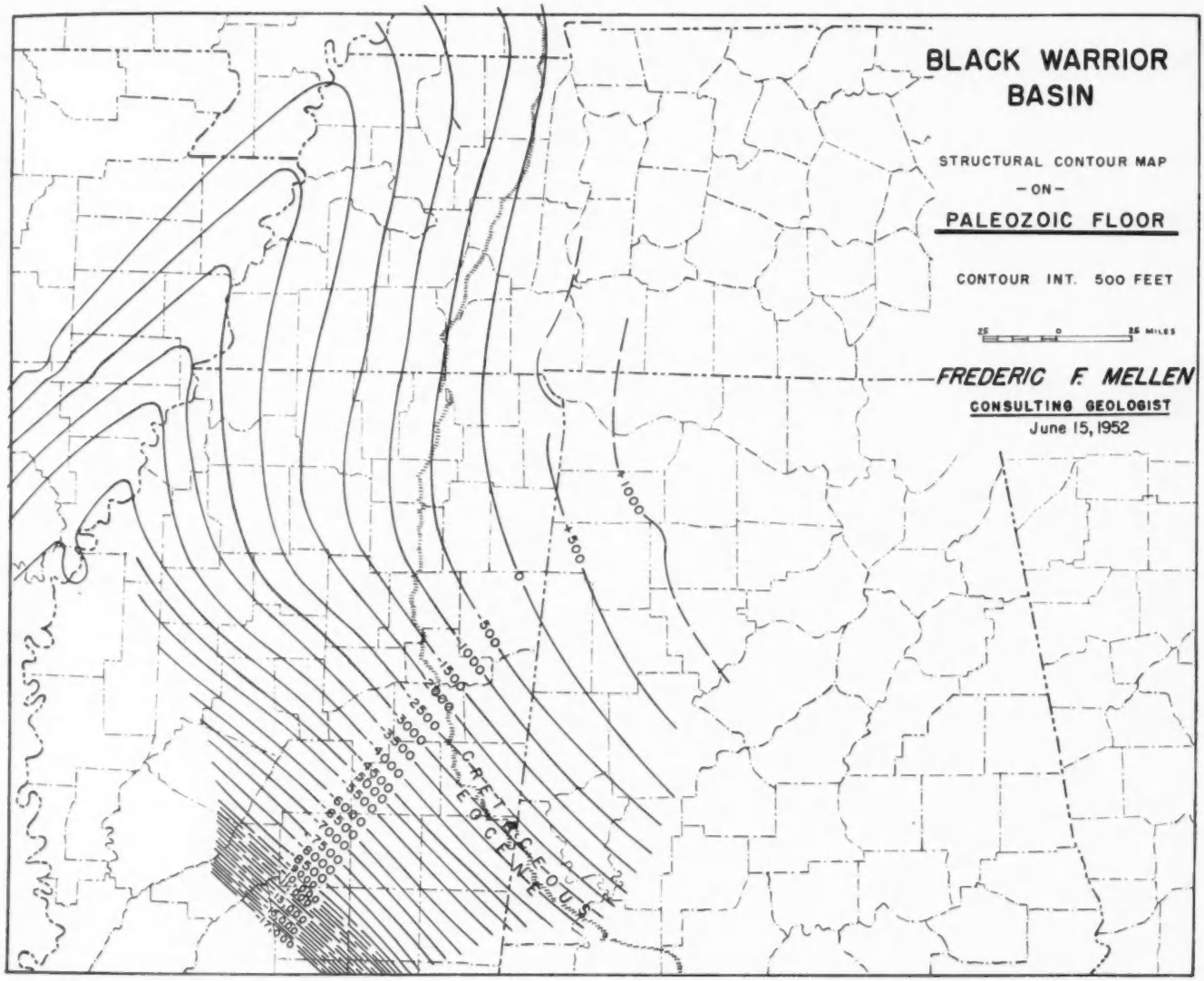
May's operations were not only tops so far this year, but there have not been any to match it since June 1952. The number of rigs being employed still trails last year's by about 400, but they are doing almost as much work. Almost as much, but not quite because the amount of footage drilled this year failed to match last year's by 1.3 percent.

The past several months have seen active drilling rigs increase steadily. And with the recent boost in crude prices, more probably will be brought into action, resulting in additional wells. It now appears that the last half of the year will be a period of substantial drilling activity, and that earlier forecasts of wells to be drilled, which many began to think were too high, may prove to be on the low side.

At the close of five months' drilling, 19,408 wells were recorded as completed, and they amounted to a gain of 1.5 percent over the 19,129 completed in last year's first five months. Those totals included old wells that were deepened, and the new well-only count was 19,212 against 18,861, an increase of 1.9 percent.

Footage drilled in those wells amounted to 77,778,454 this year, a decline of 1.3 percent from the 78,784,185 feet penetrated in last year's wells. On the average, each new well completed this year has been 4040 feet, while a year ago the average depth was 4162 feet. That explains, to some degree, how fewer rigs could drill more wells. But it is not all the answer, for the number of active rigs, has dropped much more than the footage decline.

The answer to the question of how fewer rigs can drill more wells is clearly one of more efficient use of drilling machines.



Black Warrior Basin

The Geology Is Favorable

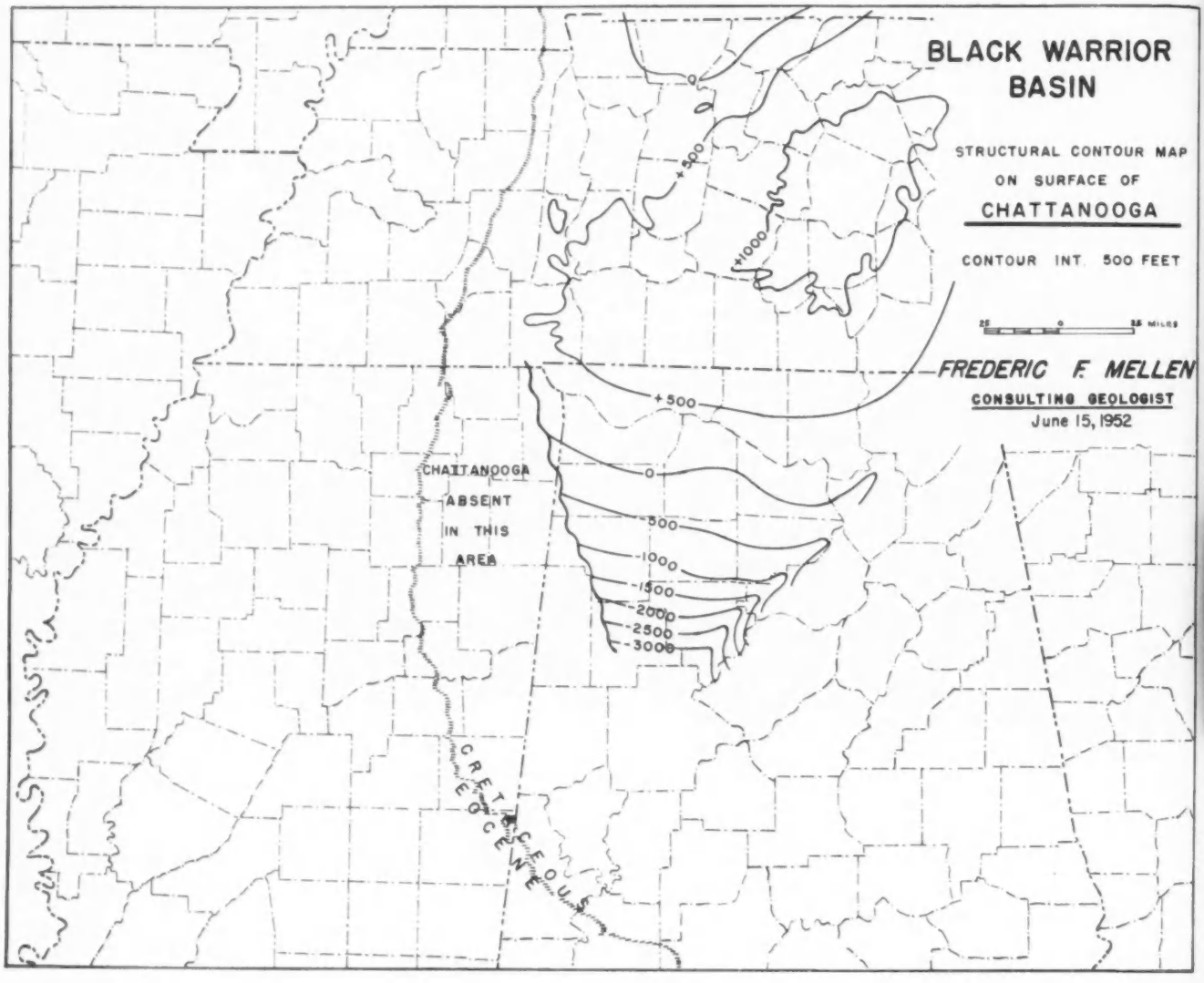
Structure and stratigraphy are complex but conducive to petroleum accumulation.

By FREDERIC F. MELLEN,
Consulting Geologist, Jackson, Miss.

Stratigraphic Summary. It is beyond the scope of this paper to discuss the stratigraphy of the highly folded and metamorphosed sediments of early Cambrian and pre-Cambrian age in eastern Alabama, but it is perhaps worthy of note that these dominantly clastic marine sediments are many thousands of feet in thickness, and that there is a possibility of the quartzitic sands and conglomerates or "granite wash" passing beneath the Black Warrior Basin as porous reservoir rocks to be sought at some future date.

The stratigraphy of the Black Warrior Basin has been fairly well set up for many years. In the Birmingham area the coal and iron ore development, with the accompanying developments of limestone and dolomite for limes, cements, and fluxes provided intensive detailed stratigraphic study by commercial, state, and federal geologists. For most of the Basin the section in the Birmingham Quadrangle is fairly representative, excepting the post-Clinton Silurian and the Devonian, both of which systems are

Part 2



typically exposed in the Tennessee River Valley of west-central Tennessee.

Two thousand feet of rocks of middle and upper Cambrian age, limestones, shales, and sandstones, are found in the Rome and Conasauga formations. These are succeeded in unconformable relationship by the Knox dolomite estimated to be 3300 feet thick in the Birmingham area, and perhaps many hundreds of feet thicker in parts of the Black Warrior Basin. There is probably no greater mass of dolomite known anywhere in the world. At the base of the Knox, its Ketona dolomite member is chert-free and is the most important source of flux in the area. In the Birmingham Valley all of the Knox is stated to be upper Cambrian in age but elsewhere dolomites and dolomitic limestones of early Ordovician age are developed, seemingly in conformity with the lower dolomites. For this reason, and in the absence of sufficient criteria, all of the dolomitic rocks in the basin between the Conasauga and the Stones River, or Chickamauga, are generally classified as Cambro-Ordovician.

The Knox in the Birmingham Valley is greatly eroded and is overlain in angular unconformity by the Attalla conglomerate, which ranges from a feather edge to 40 feet of chert and quartzite pebbles up to five inches in diameter embedded in medium-grained sandstone. Such a basal conglomerate has not yet been noted in subsurface and is of only local development in the Appalachian valleys.

The younger (Ordovician) Knox is developed extensively throughout the subsurface west of the axis of the Sequatchie anticline. More or less erratic zones of porosity are developed widely in northeastern Mississippi, northern Alabama, and around the Nashville dome through many hundred feet of the section. The porous bands are generally thin, and the porosity is developed in thin sandstones of rounded and frosted grains, in crystalline dolomite, or in cherty zones. Although blanket porosity in the usual sense is not implied, a study of the salinity of waters from the so-called "St. Peter" zone reveals greater salinities in the synclinal areas. In a large area on the southwest flank of the Nashville dome fresh or nearly fresh waters are found, suggesting invasion in the west Tennessee arch area when that area was breached during Mesozoic time. Showings of oil and gas have been common in the Knox, particularly near the top, but none has been commercially produced in this province.

The Chickamauga limestone of Birmingham Quadrangle includes rocks that are more perfectly known in the Nashville dome area, including, in ascending order, the Stones River, Black River, and Trenton series. The

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pencil-cave bentonite in the upper Black River, which is an important datum horizon in Kentucky, eastern Tennessee and northeast Alabama, is absent in most of the Black Warrior Basin. The Black River-Trenton contact is generally sharp indicative of unconformable relationships. Immediately below this contact showings of oil and gas have been common. Detailed sample studies reveal many criteria for correlation in the Ordovician over greater or less distances. There is subsurface evidence of marked thinning of the entire Ordovician toward the deeper part of the Basin so that the unconformities within the Ordovician and at the top of the Ordovician become of greater magnitude. The top of the Ordovician in much of the area is marked by a relatively uniform blanket 30-50 feet in thickness of brownish gray silty calcareous shale, commonly containing crystalline, phosphatic and cherty limestone in the lower part. This horizon is the Fernvale formation of Richmond age. Its top, in unconformable contact with the reddish crystalline limestones of Silurian age, is commonly yellow. The top of the Ordovician is one of the best datum horizons in the province.

The Silurian and Devonian rocks in the basin are related more closely to those of west-central Tennessee, and in turn with those of southern Illinois and eastern Missouri. Their horizons are mostly represented by unconformity in the Birmingham area. The outcrop section as developed by the Tennessee Geological Survey, contains four Silurian formations and nine Devonian formations. The section is modified from the Tennessee usage by including the Chattanooga in the Devonian and by excluding the Fernvale from the Silurian. Both on the outcrop and in the subsurface it is difficult to recognize the Silurian-Devonian boundary. Further work on this problem is needed. Elements of the Siluro-Devonian section of the outcrop can be identified only by painstaking sample study. As an example, the Flat Gap limestone has been identified in the Levan and Akers' Whitaker 1 in Tishomingo County, Mississippi. This formation is not known in the outcrop Devonian section of Mississippi, set up by W. C. Morse, but its type area is in Hardin County, Tennessee, a few miles away. Marked truncation of the Siluro-Devonian sediments reveals an important stage in the geological development of the region. It reveals the magnitude of the unconformity at the base of the Chattanooga (Arcadian revolution), and it furnishes an important interval for construction of isopach maps.

The Chattanooga shale is a valuable datum through most of north Alabama. Here, as on the outcrop in the northeast corner of Mississippi, and on the western Highland Rim of the Nashville dome it is thin, reaching a maximum thickness of 35 feet. It is characteristically black, fissile, petroliferous shale, and is progressively sandier farther west. Locally on the outcrop, and almost everywhere in the subsurface in Mississippi, it is absent.

The thin Maury green shale or sandstone, frequently correlated as the upper member of the Chattanooga, is, unlike the Chattanooga, glauconitic, the glauconite ranging upward for a hundred feet into the overlying Mississippian chert or shaly limestone. This is evidence that the Maury is basal Mississippian, probably Kinderhook in age, perhaps correlative with the New Providence shale of central Tennessee, or the Springville green shale of southern Illinois.

All of the lower Mississippian beds, of Kinderhook, Osage, and Meramec age, occupy over 400 feet of section in the north part of the Basin, thin-

SUMMARY OF ROCK UNITS— BLACK WARRIOR BASIN

ROCKS OF BIRMINGHAM QUADRANGLE

(AFTER C. BUTTS)

SYSTEM	SERIES	FORMATION		THICKNESS	REMARKS
PENNSYLVANIAN	POTTSVILLE			2300-5100	SANDSTONE, SHALES & COALS
MISSISSIPPIAN	?	PARKWOOD	FLOYD SHALE	200-2000	SHALE, SANDSTONE THIN LS & THIN COAL
		PENNINGTON			RED & GREEN SHALE & LIMESTONE
		U. BANGOR			LIMESTONE & SHALE
	CHESTER	HARTSELLE		100	SANDSTONE & SHALE
		L. BANGOR		200±	LIMESTONE & SHALE
	LOWER	FORT PAYNE		90-200	LIMESTONE & CHERT
DEVONIAN		CHATTANOOGA		10±	BLACK FISSILE SHALE
		FROG MOUNTAIN		2-20	CONGLOMERATIC SANDSTONE
SILURIAN		CLINTON		250-500	SHALE, SANDSTONE, LIMESTONE & IRON ORE
ORDOVICIAN		CHICKAMAUGA		360-1200	LIMESTONE
		ATTALLA MEMBER		0-40	CONGLOMERATIC SANDSTONE
	UPPER	KNOX*		3300	CHERTY DOLOMITE
		KETONA MEMBER		1500-6001	CHERT FREE DOLOMITE
CAMBRIAN	MIDDLE	CONASAUGA		0-1100±	LIMESTONE & SHALE
	LOWER	ROME		1000 ±	SHALE, SANDSTONE & LIMESTONE

* ALL KNOX IN BIRMINGHAM VALLEY IS CAMBRIAN

SILURIAN AND DEVONIAN ROCKS

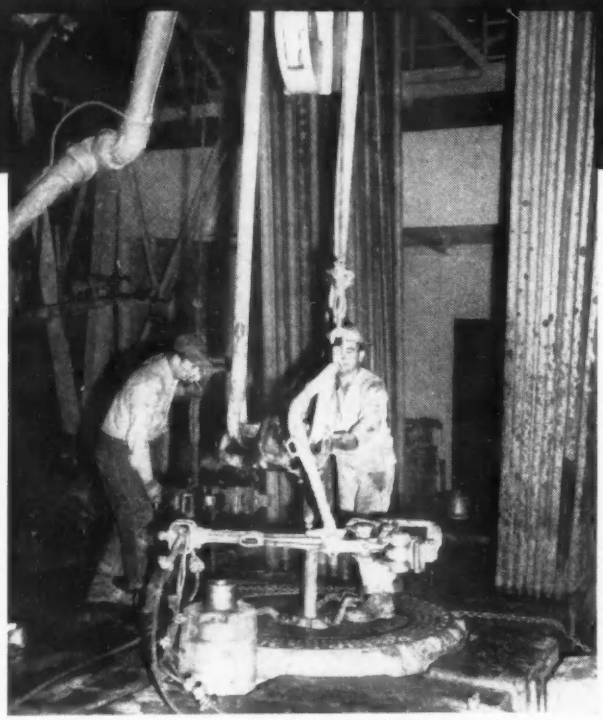
WESTERN VALLEY OF TENNESSEE RIVER

(AFTER TENNESSEE GEOLOGICAL SURVEY)

SYSTEM	SERIES	FORMATION	MEMBER	THICKNESS	REMARKS
DEVONIAN	UPPER	CHATTANOOGA		0-20	BLACK FISSILE SHALE WITH BASAL SANDSTONE
		PEGRAM		0-10	PURE MASSIVE LIMESTONE
	MIDDLE	CAMDEN		0-200	NOVACULITIC CHERT
		HARRIMAN		0-60	NOVACULITIC CHERT
		QUAIL		0-10	CHERTY LIMESTONE
		DECATURVILLE		0-10	POROUS CHERT
	LOWER	BIRDSONG		0-70	FOSSILIFEROUS SHALE & LIMESTONE
		OLIVE HILL	FLAT GAP	0-55	PURE MASSIVE LIMESTONE
			BEAR BRANCH-PYBURN	0-45	IMPURE CHERTY LIMESTONE
			ROSS	0-60	IMPURE CHERTY LIMESTONE
		ROCKHOUSE		0-26	CALCAREOUS SHALE & LIMSTONE
SILURIAN*	CAYUGAN	DECATUR		0-75	PURE MASSIVE LIMESTONE
			LOBELVILLE	0-75	ARGILLACEOUS LIMESTONE
		BROWNPORT	BOB	0-65	PURE MASSIVE LIMESTONE
	NIAGARAN	?	BEECH RIVER	0-106	FOSSILIFEROUS SHALE & LIMSTONE
			DIXON	0-45	VARIEGATED SHALES & LIMESTONE
		WAYNE	LEGO	0-45	DENSE LIMESTONE
			WALDRON	0-5	LIGHT GRAY LIMY SHALES
			LAUREL	0-30	DENSE PINKISH LIMESTONE
			OSGOOD	0-15	REDDISH ARGILLACEOUS LIMESTONE
	MEDINAN	BRASSFIELD		0-15	GLAUCONITIC SANDY LIMESTONE

* THE SUBJACENT RICHMOND SEDIMENTS, FERNVALE AND ARMHEIM ARE PLACED IN THE ORDOVICIAN BY MOST WORKERS

TUBULAR PRODUCTS



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- The reduced outside diameter of the joint which increases hole clearance

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- 100% joint strength in all weights
- 50% of threaded connections eliminated by integral type joint giving high resistance to damage
- Streamlined interior and exterior contours, the first of which lends itself to the maximum protection given by plastic coating
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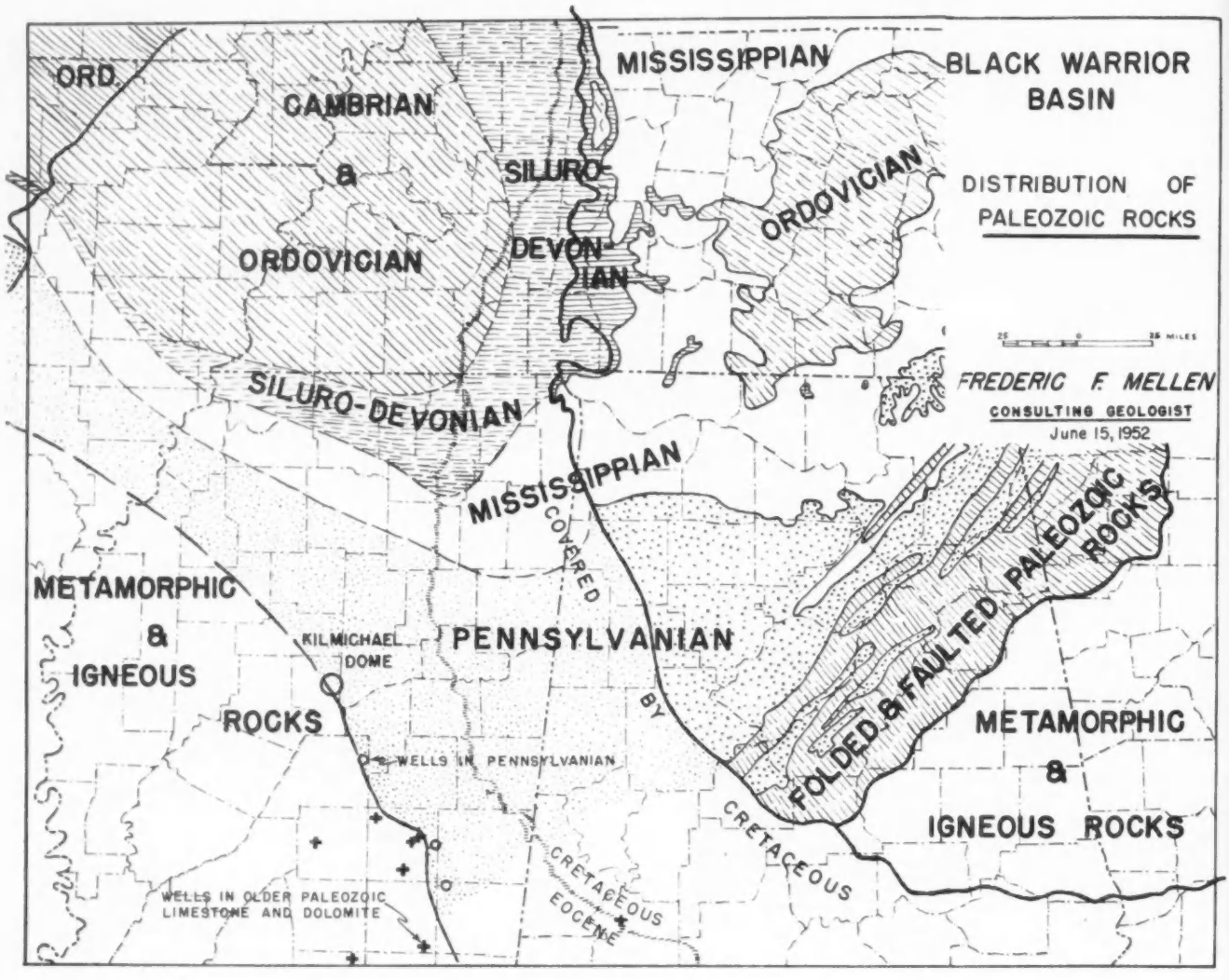


ning downdip to less than 150 feet. Those beds are characteristically shaly and cherty in the lower parts and in the upper parts are richly fossiliferous, crystalline, and locally oolitic, and commonly show oil and gas or water in the test wells. Locally, red shale and pink crystalline limestone (possibly St. Joe in age), similar to the Silurian Wayne formation, are developed in the lower part. These beds are separated from the overlying Chester series by an unconformity. The base of the Chester is a relatively easy datum to recognize in samples.

The Chester series, averaging more than 1000 feet in thickness, has been divided into many formations in Alabama, Mississippi and Tennessee. The sequences and lithologic character very roughly parallel those of the Chester in the type Illinois section. Lenticular sands, thick sandy marine shales and oolitic and dense limestones are common. An isolithic map will indicate an increasingly clastic character toward the deeper parts of the Basin. High percentages of limestone nearer the Nashville dome and the Appalachian front are suggestive of the reef-building tendencies of Chester time. In the upper part of the Chester are about 500 feet of thin beds of limestone and dark red and green shales, in addition to characteristic dark gray silty fossiliferous shales. This section is characterized by the presence of "ankerite" pellets and commonly has at its base a clean fine-grained sandstone. This entire section may be Pennington in age, the basal sand of which is the Carter gas sand and much younger than the Hartselle sandstone which is developed low in the Chester. A primitive fusulinid fauna of the genus *Paramillerella* in Gregg-Tex' Burdine 1, Itawamba County, Mississippi, from 150 feet above the Carter gas sand has been described by M. L. Thompson. These forms, associated with *"Endothyra,"* are present in a number of wells in the Pennington limestone. This is the only reported fusuline fauna in the province.

Overlying the Pennington in Birmingham Quadrangle are 200-2000 feet of fine-grained clastic sediments, fine-grained sandstones and sandy micaceous shales containing thin fossiliferous beds, and locally developed limestone. This section, which is regressive in character, has both Mississippian and Pennsylvanian characteristics, both lithologically and faunally. Contrary to published statements, the Parkwood, although locally overlapped, is developed in the basin. It is well exposed in the outcrop in Franklin and Marion Counties, Alabama, shows a tendency to thicken Basinward, and is a useful contour datum.

Following the original definition of Williams in 1891, when he defined the Pennsylvanian as the strata between the base of the so-called "Millstone

Continued on Page 114.

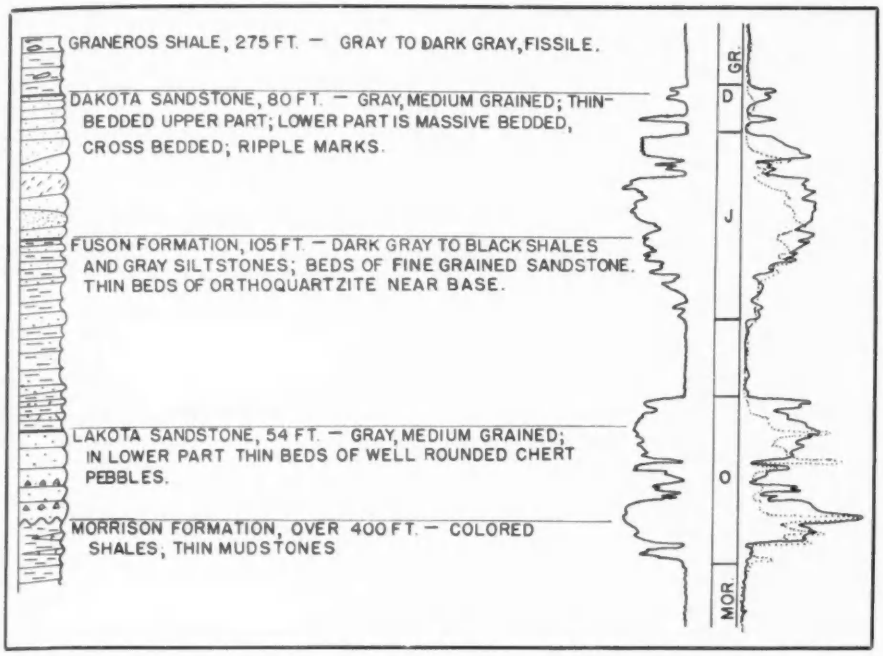

GRANEROS SHALE, 275 FT. — GRAY TO DARK GRAY, FISSILE.
DAKOTA SANDSTONE, 80 FT. — GRAY, MEDIUM GRAINED; THIN-BEDDED UPPER PART; LOWER PART IS MASSIVE BEDDED, CROSS BEDDED; RIPPLE MARKS.
FUSON FORMATION, 105 FT. — DARK GRAY TO BLACK SHALES AND GRAY SILTSTONES; BEDS OF FINE GRAINED SANDSTONE. THIN BEDS OF ORTHOQUARTZITE NEAR BASE.
LAKOTA SANDSTONE, 54 FT. — GRAY, MEDIUM GRAINED; IN LOWER PART THIN BEDS OF WELL ROUNDED CHERT PEBBLES.
MORRISON FORMATION, OVER 400 FT. — COLORED SHALES, THIN MUDSTONES
GR
D
L
O
MOR

Fig. 1. The Dakota group in Oklahoma Geology Camp, north of Florence, Colo. The electric log diagrams taken from well in Washington County, eastern Colorado.

Mistakes Can Be Costly In Geologic Correlations

- **Here are the problems involved.**
- **Why they have remained unsolved.**
- **A new approach toward their solution.**

By DR. CARL A. MOORE, Associate Professor of Geology
University of Oklahoma, Norman, Okla.

PERHAPS MORE geologists today are concerned with the study of subsurface geologic correlations than with any other single phase of geologic endeavor.

Surface correlations based largely on paleontologic criteria are being carried into subsurface work. Many techniques peculiarly adapted to subsurface work are being introduced, while others are being developed and enlarged. All these are pointing to the higher levels of precise correlations which are demanded for modern petroleum exploration.

Mistakes in correlations can and often do result in the failure to properly evaluate a given prospect. Correlations are being studied and restudied in an effort to obtain a workable basis for relating the rocks in one well bore with those in an adjacent well. Many of the stratigraphic problems which revolve around paleontological correlations do not seem to be resolved by referring solely to the fossil record.

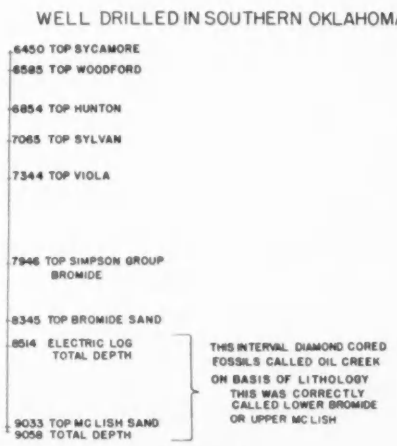


Figure 2.

Some questions in paleontological correlations will be illustrated here, with an explanation as to why many of these problems have remained unsolved; and an approach to the solution of some of them will be offered.

Throughout the Rocky Mountain area, and extending into Kansas and Oklahoma, the lower part of the Cretaceous sequence of rocks is made up of a lower sandstone formation, a middle shale, and an upper sandstone formation. This has been collectively termed the "Dakota" group, with the unconformity between the lower Cretaceous and upper Cretaceous being placed at various places within the sequence. The "Dakota" group, in the Oklahoma Geology Camp area, north of Florence, Colo., (Figure 1) has been divided into the Lakota, Fuson, and Dakota formations. Electric log diagrams were taken from a well in eastern Colorado to illustrate the letter-designated sandstones of the "Dakota" group.

Chief Break. The chief lithologic break may be found at the base of the lower sandstone formation, where it rests on the Morrison formation of Jurassic age. Early workers placed the contact between the Lower and Upper Cretaceous below the upper sandstone formation on the basis of poorly preserved plant remains. Since that time, the contact has been placed at the top of the Morrison, at the top of the lower sandstone member, within the middle shale formation, at the base of the upper sandstone formation, and even up in the Graeros shale above the "Dakota."

The most recent correlation places the Lower Cretaceous-Upper Cretaceous contact between the middle shale and the upper sandstone formation. This is based on the latest paleontological studies, and on the finding of marine Lower Cretaceous fossils, Gryphea, in the middle shale. In this case, continuing paleontological study has finally placed the contact at the most reasonable place.

In southern Oklahoma, a well was drilled to test the McLish sandstone of the Simpson group (Figure 2). At the base of the Lower Bromide sandstone, drilling ceased and continuous cores were cut to the total depth. On the basis of lithology, the limestones and shales, with the few thin sandstone

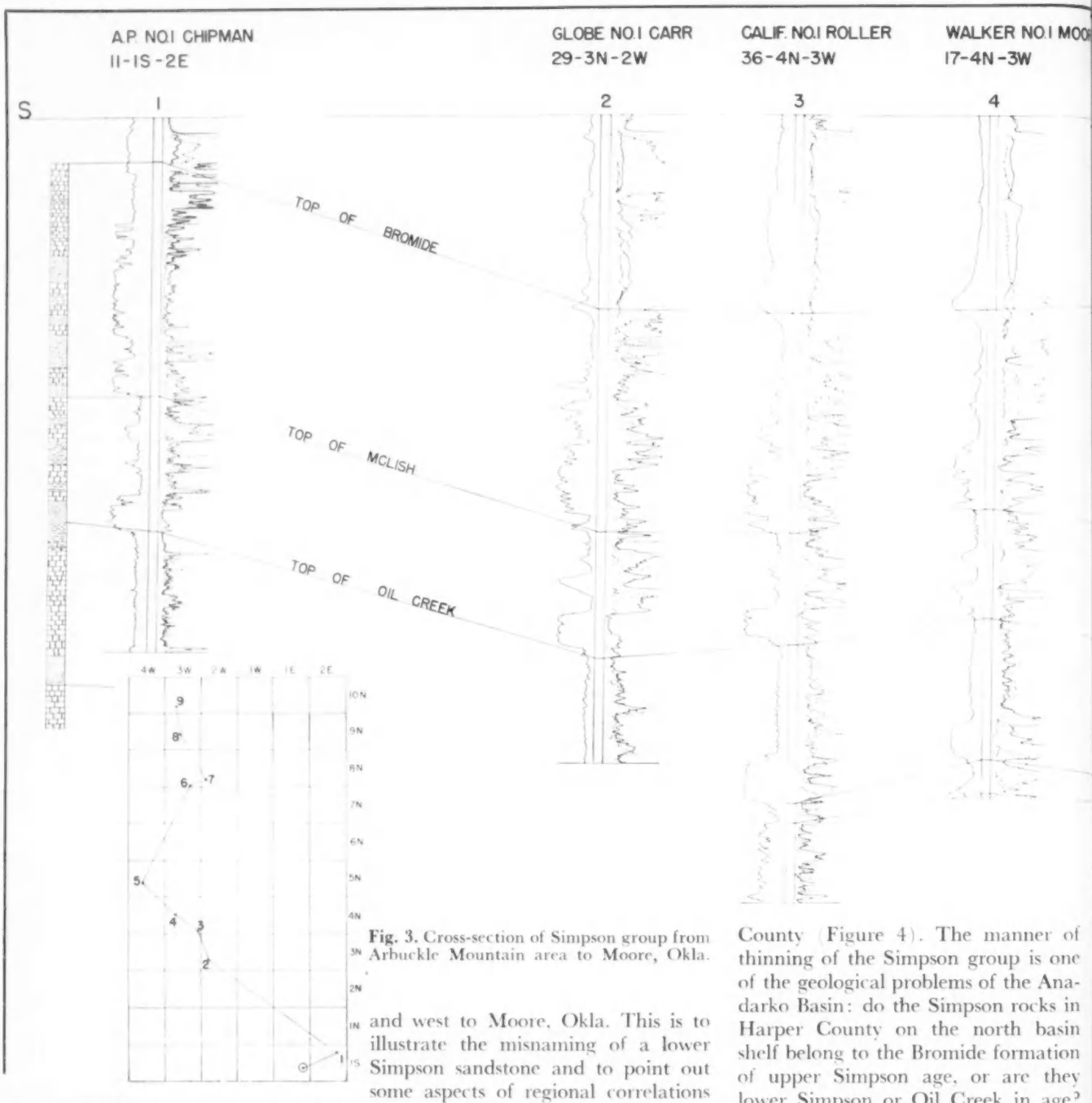


Fig. 3. Cross-section of Simpson group from Arbuckle Mountain area to Moore, Okla.

beds, found in the cores, were called lower Bromide or McLish. Microfossils taken from the cored interval, however, were called Oil Creek (Table 1) the statement being made that the McLish was faulted out. Continued coring finally reached the McLish sandstone, at which depth the lithology and intervals checked perfectly with nearby control wells. In this case paleontological studies were incorrect and almost caused the cessation of coring before the contract depth was reached.

Figure 3 is an electric log cross-section showing correlations in the Simpson group from the type section in the Arbuckle Mountain area north and west to Moore, Okla. This is to illustrate the misnaming of a lower Simpson sandstone and to point out some aspects of regional correlations within the Simpson group.

The greatest thickness of the Simpson is approximately 2700 feet in the Arbuckle Mountain area, if the maximum surface thicknesses of each unit are totalled. Northward, the Simpson thins to 1400 feet at Maysville, 1050 feet at Noble, and 900 feet at Moore. Moving on northwestward across the Anadarko Basin, the Simpson group is 600 feet in Major County, 330 feet in Harper County, and 100 feet in Beaver County (Figure 4). The manner of thinning of the Simpson group is one of the geological problems of the Anadarko Basin: do the Simpson rocks in Harper County on the north basin shelf belong to the Bromide formation of upper Simpson age, or are they lower Simpson or Oil Creek in age?

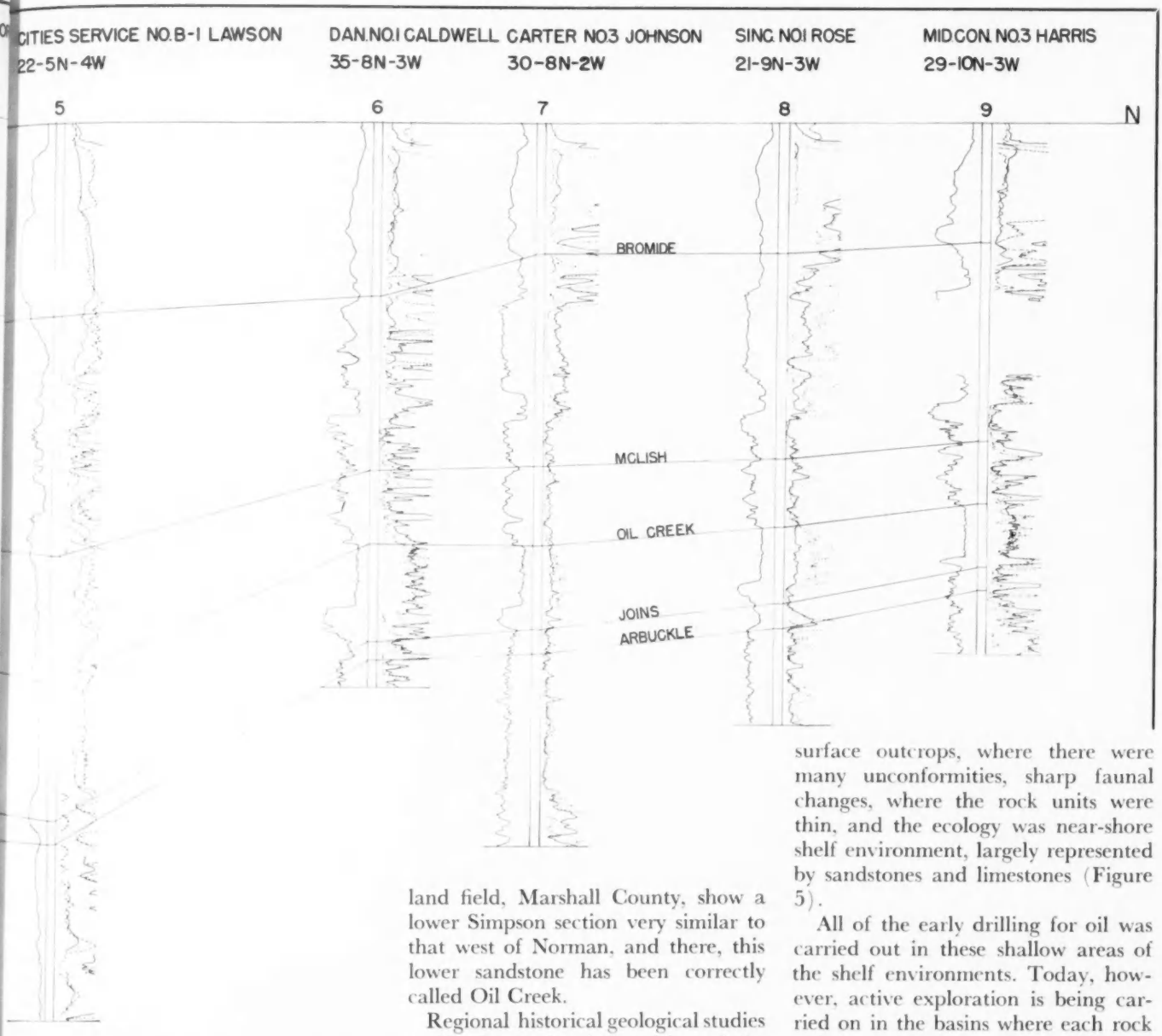
On the basis of the cross-section in Figure 3, and incomplete correlations carried northward, it is believed that the rocks of Simpson age along the northern flank of the Anadarko Basin are upper Simpson in age.

TABLE 1

Simpson Group	Bromide McLish Oil Creek Joins

Joins Sandstone. West of Norman, Oklahoma, a sandstone near the base of the Simpson group was called Joins because Joins fossils were found in the limestone immediately above the sandstone. This particular sand is well developed in the California Roller 1, Sec. 36-4n-3w, and in the Walker Moore 1, Sec. 17-4n-3w.

This cross-section (Figure 3) shows that the Oil Creek member of the



Simpson thins both in the middle and at the bottom. The Joins formation, however, maintains a fairly constant thickness of less than 100 feet, which correlates closely with the Joins as exposed in the type section that is diagrammed on the left side of the cross section.

It cannot be reasoned that the Joins formation will thicken northward while the other formations of the Simpson become thinner. Furthermore, based on the similar electrical characteristics of the Oil Creek limy shales which are easily traced across the cross section, the manner of thinning of the Oil Creek can be studied. Hence, it is believed that this lower Simpson sandstone must be Oil Creek in age. Electric log diagrams of well known thick Simpson sections in southern Oklahoma, as in Cumberland field, Marshall County, show a lower Simpson section very similar to that west of Norman, and there, this lower sandstone has been correctly called Oil Creek.

Regional historical geological studies verify the mode of deposition of the Simpson group of rocks in the asymmetrical Anadarko Basin. From the maximum thickness in the Arbuckle Mountain area, where all units are present in maximum development, the Simpson onlaps northward across the basin. Thus it is shown that the Simpson thins by loss of section at the base. The lower Simpson seas were confined to the southern or deeper parts of the basin. Younger, upper Simpson, seas spread farther up and out of the basin and finally the upper Simpson seas flooded across the foreland shelf areas along the north edge of the basin.

Out of a dilemma of correlations, based on paleontology points versus lithologic breaks, a possible solution is suggested:

In the late 1800's when the type sections of the rock systems were being set up, all study was carried out along the surface outcrops, where there were many unconformities, sharp faunal changes, where the rock units were thin, and the ecology was near-shore shelf environment, largely represented by sandstones and limestones (Figure 5).

All of the early drilling for oil was carried out in these shallow areas of the shelf environments. Today, however, active exploration is being carried on in the basins where each rock unit is present in maximum thickness and development; where there are a minimum number of unconformities, and where the ecology is deep marine conditions, with deposition being largely shales.

The type sections, along the shelves, depended on many unconformities and sharp faunal changes for their delineation. In the basins today there are few if any unconformities, and there are few readily identifiable faunal changes to denote the contact between the formations and groups. In the basins one would expect to find the older fossil forms mixed with the newly evolved forms. By the time the succeeding sequence of rocks was deposited in the shelf area, only the new fossil form was present and is hence called the 'index' fossil. There will be a mixing of faunas in the basins such that it will be difficult to adequately

designate a contact between two formations based solely on paleontology.

It appears that the time-honored diastrophism and paleontology are not as useful for dividing groups of formations in the basins as they are along the near-shore shelf areas.

New Era. Paleontology was the first great tool for the study of stratigraphy and the nomenclature of formations and groups of formations. Stratigraphic paleontology was all important, and most of the great geologists were also great paleontologists.[2]

With the advent of paleobiology, however, we have entered a new era of paleontological thought. Emphasis is placed on the description of the individual fossil, on erecting new species or new genera, on morphological studies to learn how the shell is developed, on the evolutionary trends that each fossil illustrates. All this information is useful to the biologist, but is hardly as applicable to the science of stratigraphy and correlations.

The science of correlations deals with the relating of one outcrop to another, one well log to another. And the subsurface stratigrapher has a most valuable tool for this work: a duplicatable, impartial, mechanical record of the nature and disposition of the rocks in a well bore, that is, the electric log diagrams. More is being learned about the potential value of the electric log diagrams; for here, in a mechanical record devoid of human inconsistencies, is portrayed the electrical character of the formations that the surface geologist, or even the microscopist who looks at the samples and cores from the well, cannot see.

Volumes have been written describing the characteristics of many formations, meaning the visible characteristics such as color, grain size, cementing material, structure, and the like, and this information has been used to correlate one outcrop with another a hundred yards, or a mile, away. How much more important the electrical characteristics of a given formation may be has not been fully evaluated or appreciated as yet. Electric log studies of closely drilled areas, together with the samples and a few cores, will yield more precise information on a given formation than if this formation were exposed in surface outcrops, because one is able to "see" all the beds on the electric log diagrams, including the soft shales, and it is possible to study the third dimension and the down-dip variations.

Fig. 4. Limits of Anadarko Basin, Western Oklahoma.

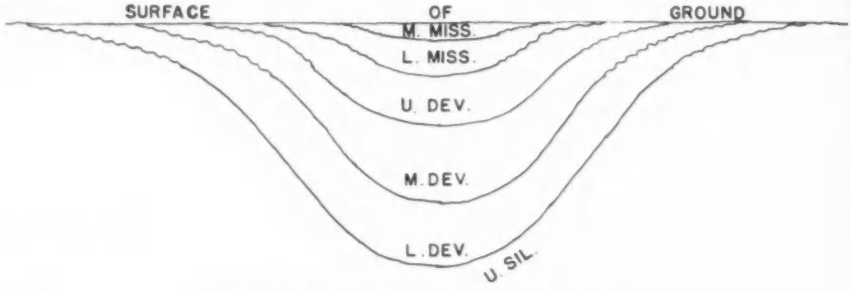


Fig. 5. Idealized cross-section of basin.

It may be pointed out that particular attention must be paid to the nature of the sedimentation in basin areas. Many oil companies are today using fossils as indicators of environments of deposition rather than as tools for correlation. Sedimentation in the deeper parts of the basins is different than that which is taking place along the shallow, shelf areas.

We need to be aware of the history of the basins of deposition. Along the foreland shelf areas there has never been thick sedimentation because this area has remained stable throughout the history of the basin.[3]

One can study the manner in which the many formations found in the basins actually thin or disappear as the shelf area is approached.

All techniques should be used for subsurface correlation, with neither one being used to the exclusion of others. The best approach will be the use of the tool or tools that will best solve the problems of the area. Paleontology should, however, be used as a tool to supplement subsurface geologic correlations, rather than making the geologic correlations fit into the paleontological correlations.—**The End.**

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About the Author

DR. CARL A. MOORE, professor of geology and chairman of the School of Geological Engineering, University of Oklahoma, received his Ph.D. in geology from the University of Iowa in 1940. He was employed by Standard Oil Development Company as research geologist on oil basins in 1940-42. He served as field subsurface geologist for The Carter Oil Company in Seminole and Oklahoma City, 1942-46. Since 1946 he has been at the University of Oklahoma, Norman, Okla.

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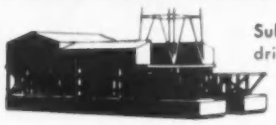

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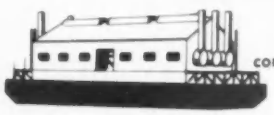

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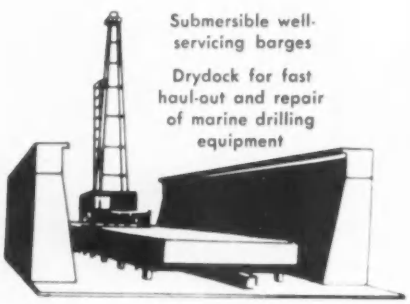

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Black Warrior Basin

Continued from Page 104.

Grit" to the top of the Dunkard formation, and the usage of Charles Butts, the base of the Pennsylvanian system is at the base of the conglomeratic sandstones which overlie the Parkwood and Pennington in pronounced unconformity. The geologic events that produced the coarsely clastic sediments above the Mississippian inaugurated the greatest period of deposition known in the basin. In the lower 1000 feet of Pennsylvanian deposition several great bodies of coarse-grained conglomeratic and arkosic sandstones are developed. In the Cahaba coal field east of Birmingham these sands in ascending order are the Shades, Pine, and Chestnut. Though normally separated by shales, which locally contain coal beds and thin fossiliferous strata, these sands, which are basal members of sedimentary cycles, locally, at least in the Black Warrior Basin, overlap the subjacent shale members so as to merge with the underlying sand. Cyclical deposition continues up through the 5000 feet or more of Pennsylvanian with increasing amounts of shales and decreasing thicknesses of the basal sands. In contrast to the 100-foot or less cycles of the Illinois basin that build up its 2500 feet of Pennsylvanian, and total more than 50 cyclothems, the cycles of the Black Warrior Basin are 100-feet or more—commonly 300 or even more than 400 feet in thickness. Also in contrast, the thin fossiliferous elements of the cycles in the Black Warrior Basin are poorly developed, and fusulinid faunas are still unknown, whereas in the Illinois basin limestones 25 feet or more in thickness and rich fusulinid faunas are common. It maybe concluded, therefore, that great uplift of the Appalachian hinterland at the onset of the Pennsylvanian period with compensating down-warping of the Black Warrior Basin produced the thicker and more clastic sedimentary cycles and inhibited development of marine faunas such as flourished in the more slowly sinking Illinois basin.

Finally, after Pennsylvanian deposition, the entire province was uplifted and received no recorded sedimentation during Permian time. From the early Mesozoic until Upper Cretaceous, the subsurface shows northward transgression of many formations over the Paleozoic floor. Although the unconformity between the Paleozoic and Mesozoic is very great, the Paleozoic floor shows a fairly smooth configuration. On the outcrop this contact is irregular and the Tuscaloosa overlaps from middle Pennsylvanian in the south to basal Mississippian in the north, in places resting on residual clays.

Many faults have been mapped in the Black Warrior Basin. These faults show in general a strike roughly normal to the axis of Appalachian folding. Grabens in Lauderdale and Colbert counties have displacements ranging from 100 to about 300 feet, where blocks of Chester sediments have been dropped deep into the lower Mississippian cherty limestones. With the exception of Appalachian and Ouachita belts of thrusting, nearly all of the faults are normal. The isocarb values increase from less than 55 percent in the deeper part of the Basin to more than 75 percent in the highly folded Appalachians.

Every Paleozoic system represented in the Basin has shown some porosity and has yielded showings of oil and gas. Gas in commercial amounts has been found in Monroe and Chickasaw Counties, Mississippi, in the Chester; in Fayette County, Alabama, about 1000 feet above the base of the Pennsylvanian; in Marion and Walker Counties, Alabama, in the Chester; in Madison County, Alabama, in the Silurian (?) at Huntsville, and probably in the Ordovician at Hazel Green. The reasons for accumulation at these places are not clear. No doubt both structural and stratigraphic elements are involved. Mississippian and Pennsylvanian strata are commonly asphaltic on the outcrop. Commercial rock asphalt operations have been developed. In wells the quality ranges from asphalts to oils of 35° to 40° and higher gravity. The best zones of porosity known are in the cherty or sandy dolomites and limestones of the Knox, of the middle and upper Devonian, and of the lower Mississippian, and in the sandstones of the Chester and lower 1000 feet of the Pennsylvanian. Many reservoirs contain sufficient salt water and permeability to afford effective water-drive.—**The End.**

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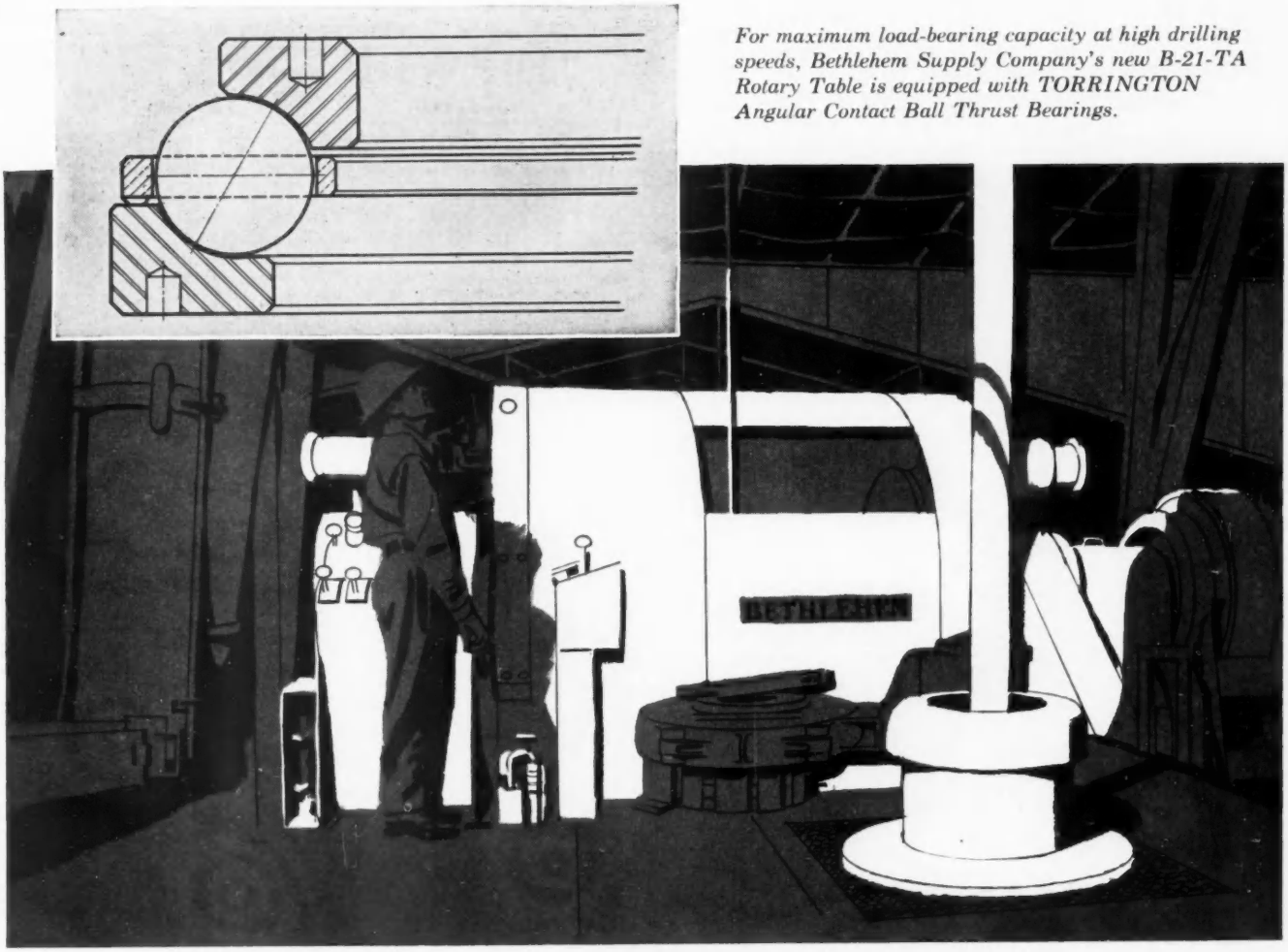

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● Exploratory drilling . . . in May and first five months 1953-1952 . . .

State or District	MONTH OF MAY, 1953													FIRST FIVE MONTHS, 1953																	
	Productive Tests									Total Productive	Unproductive Tests			Total Exploratory Tests	Productive Tests									Total Productive		Unproductive Tests			Total Dry		Total Exploratory Tests	
	New Fields			New Pays			Extensions								New Fields			New Pays			Extensions										
	Oil	Dis.	Gas	Oil	Dis.	Gas	Oil	Dis.	Gas		Wildcats	New Pays	Outposts		Oil	Dis.	Gas	Oil	Dis.	Gas	Oil	Dis.	Gas	5 Mo. 1953	5 Mo. 1952	Wildcats	New Pays	Outposts	5 Mo. 1953	5 Mo. 1952	5 Mo. 1953	5 Mo. 1952
Alabama											8			8											2	26			26	12	26	14
Arizona											1			1												4			4	1	4	1
Arkansas			1	1						2	7			9	4		1	7						12	10	40			40	28	52	38
California	1		1	2			3			7	29		5	41	9		2	10		3	10		1	35	43	162		21	183	153	218	196
Colorado	2		3				1			6	23			29	7		8			1	1			17	15	111			111	61	128	76
Florida											2			2												13			13	4	13	4
Georgia																										3			3		3	
Idaho																										1			1		1	
Illinois	1						4			5	41			46	4			7			12			23	37	158			158	187	181	224
Indiana	2			1		1				4	33			37	10		1	1		1	2			15	10	135			135	141	150	151
Kansas	13		2				3			18	89			107	64		11	2			3			80	50	380			380	345	460	395
Kentucky	1						1			2	15			17	10		1				2			13	13	43			43	43	56	56
Louisiana	3	2	1	6		1	1			14	29			43	11	6	1	17	5	1	5	2	1	49	44	145		2	147	127	196	171
North Louisiana	1	1		2			1			5	18			23	1	1		3	1		3			9	21	68		1	69	63	78	84
South Louisiana	2	1	1	4		1				9	11			20	10	5	1	14	4	1	2	2	1	40	23	77		1	78	64	118	87
Michigan							1			1	27			28	5			2			2			9	19	92			92	99	101	118
Mississippi	1				1					2	13		1	16	4	1	2	3	1		1	1		13	13	76		2	78	69	91	82
Missouri											4			4												7			7	8	7	8
Montana											5			5	2			1						3	2	30			30	18	33	20
Nebraska	1									1	12			13	7						1			8	7	62			62	39	70	46
Nevada																										5			5		5	
New Mexico			4						2	6	4			10	6		8	1			4		2	21	31	51			51	53	72	84
New York																															
North Dakota	4						1			5	3			8	4						1			5	8	18			18	3	23	11
Ohio											1			1							1		1	2	6	10			10	14	12	20
Oklahoma	15		4	1			10			30	74			104	46	3	13	15		1	26		1	105	79	306			306	270	411	369
Pennsylvania																							1	1						2	1	2
South Dakota											1			1												3			3	1	3	1
Texas	35	6	8	23	8	4	15	5	2	106	354		8	468	204	32	39	99	16	15	59	8	10	482	446	1700		46	1746	1698	2228	2144
Dist. 1 S. Central		1						1		2	33		1	36	5	2	1	1	1		1	1		12	16	132		4	136	130	148	146
Dist. 2 Middle Gulf		1	2	1	1			1	1	7	24			31	7	5	4	5	1	1		1	1	25	49	121		2	123	120	148	169
Dist. 3 Upper Gulf			1	4	4	1	1	2		13	33		3	49	11	5	2	22	9	6	6	4	5	70	62	144		27	171	147	241	209
Dist. 4 L.Gulf-S.W.	5	1	4	4	3	2	1			20	36			56	20	11	19	23	5	7	2	1	3	91	41	185		3	188	184	279	225
Dist. 5 E. Central	1	1		1						3	16			19	3	1	1	2						7	3	61			61	42	68	45
Dist. 6 Northeast		1		1						2	10			12	2	3		4						9	15	59			59	54	68	69
Dist. 7-B N. Cent.	16		1	1			1			19	72			91	68		9	13			13			103	94	387		1	388	372	491	466
Dist. 7-C W. Cent.	3	1		5						9	29		2	40	22	5	1	11			4			43	44	147		2	149	166	192	210
Dist. 8 West	3			4			1			8	38		1	47	30		1	5			17			53	54	140		2	142	167	195	221
Dist. 9 North	7			2		1	11	1	1	23	62		1	86	35		1	13		1	15	1	1	67	67	323		5	328	296	395	363
Dist. 10 Panhandle											1			1	1						1			2	1	1			1	20	3	21
Utah	1									1	4			5	3		1							4		21			21	18	25	18
West Virginia																									1				2		3
Wyoming	1			1						2	5			7	6			1						7	12	34			34	37	41	49
Total U.S.	81	8	24	35	9	6	40	5	4	212	784		14	1010	406	42	91	163	22	22	130	11	17	904	848	3636		71	3707	3453	4611	4301

Upswing Continues, 1010 Tests in May

By **CECIL W. SMITH,** WORLD OIL Staff

THIS YEAR'S EXPLORATORY drilling campaign has been one of much activity and has gained ground in the past several months. Completed tests recorded in May were the second highest for any period of this year, and the year's total holds a 7.2 percent lead over last year's record-breaking operations.

A total of 1010 exploratory tests were reported as complete during May, and they were second only to the 1020 recorded in January. April's operations amounted to 888 completed wells. At the end of April, the year's tests held a lead of 7.0 percent over last year's wells, and at the end of May this lead had been widened to 7.2 percent. Continued increase in exploration seems to be in store.

The recent general crude price increase will certainly add impetus to this program that already was going at record levels. Of course, any boost caused by the crude increase will not show up as a gain in completed wells for several months, but it is most probable.

Total exploratory completions in the first five months of this year amounted to 4611, which was a gain of 7.2 percent over the 4301 credited to the comparable period of 1952. Despite the gain in this year's activity, the dry hole-to-producer ratio showed very little change from last year's. So far a total of 904 wells have been successful for a score of 19.6 percent of the total drilled. Last year at the same time 848 successful tests amounted to 19.7 percent of the total.

Summary of Results of Exploratory Drilling

ITEM	May, 1953	April, 1953	FIVE MONTHS January-May 1953	1952	Percent Diff.
Oil Discoveries	**116**	**112**	**569**	**554**	**+ 2.7**
New Fields	81	78	406	408	— 0.5
New Pays	35	34	163	146	+ 11.6
Distillate Discoveries	**17**	**15**	**64**	**54**	**+ 18.5**
New Fields	8	12	42	47	— 10.6
New Pays	9	3	22	7	+214.3
Gas Discoveries	**30**	**20**	**113**	**81**	**+ 39.5**
New Fields	24	13	91	63	+ 44.4
New Pays	6	7	22	18	+ 22.2
Total Discoveries	**163**	**147**	**746**	**689**	**+ 8.3**
Extensions to Fields	**49**	**25**	**158**	**159**	**— 0.6**
Oil Fields	40	19	130	132	— 1.5
Distillate Fields	5	2	11	5	+120.0
Gas Fields	4	4	17	22	— 22.7
Total Prod. Tests	**212**	**172**	**904**	**848**	**+ 6.6**
Dry Holes	**798**	**716**	**3707**	**3453**	**+ 7.4**
Wildcats	784	695	3636	3283	+ 10.8
New Pays				9	—100.0
Outposts	14	21	71	161	— 55.9
Total Expl'tory Tests	**1010**	**888**	**4611**	**4301**	**+ 7.2**
Percent Productive	21.0	19.4	19.6	19.7	
Percent Dry	79.0	80.6	80.4	80.3	

U. S. Discoveries in May

NEW FIELDS, NEW PAYS AND EXTENSIONS

ARKANSAS—NEW OIL PAY

Nevada County, Irma field. Ranney Exploration Co.'s J. D. Reynolds 1, C SW SE SW 31-13s-20w, pumped 60 barrels oil and 60 barrels water from Travis Peak sand, Lower Cretaceous 3016-22 feet, 31-gravity, completed 5-4-53, TD 3500.

ARKANSAS—NEW GAS FIELD

Washington County, West Fork field. Arkansas Western Gas Co.'s T. S. Threlkeld, Sr. 1, in 5-14n-30w, flowed 1.5 million from Sylamore sand Mississippian, 566-86 feet, completed 1-22-53, TD 586.

CALIFORNIA—NEW OIL FIELD

Los Angeles County, Mission field. Standard Oil Co.'s Mission 6-1, in 2-2n-16w, flowed 229 barrels oil and 9 barrels water from 7200-7338 feet, 24/64-inch, 24.6-gravity, completed 5-17-53, TD 7338.

CALIFORNIA—NEW OIL PAYS

Kern County, Tejon Hills field. O. M. Slosson's Tejon 34, in 22-11n-18w, pumped 78 barrels from Valv 6 sand, Miocene 853-960 feet, completed 4-23-53, TD 1398.

Tunis Creek field. Standard Oil Co.'s Tejon-3 37-21, in 21-11n-18w, pumped 11 barrels oil and 3 barrels water from 1465-90 feet, 30-gravity, completed 5-16-53, TD 1493.

CALIFORNIA—OIL FIELD EXTENSIONS

Fresno County, Guijarral Hills field. Superior Oil Co.'s Sanger 4-1, in 1-21s-16e, Old Well Worked Over, flowed 133 barrels from 8258-71 feet, 16/64-inch, 29.1-gravity, completed 5-17-53, TD 8999.

Kern County, Belgian Anticline field. A. J. West, Operator's Tide Water Associated-Fee 1, in 15-30s-21e, northwest extension, pumped 175 barrels from Phacoides sand, Miocene 3422-57 feet, 36.2-gravity, completed 5-13-53, TD 3457.

Orange County, Richfield field. California Exploration Co.'s Kraemer E-1, in 30-3s-9w, west extension, pumped 100 barrels from 4710-25 feet, completed 4-10-53, TD 4967.

CALIFORNIA—NEW GAS FIELD

Glenn County, Bee Hive Bend field. Sunray Oil Corp.'s Estes 1, NW NW 19-19n-1w, flowed 3.5 million from 3653-65 feet, 26/64-inch, completed 4-29-53, TD 3678.

COLORADO—NEW OIL FIELDS

Adams County, Badger Creek area. Forest Oil Co.'s C. D. Causey 1, NE SW NW 23-2s-57w, pumped 213 barrels from "D" sand, Upper Cretaceous 5245-75 feet, 40-gravity, completed 5-15-53, TD 5429.

Morgan County, Empire Reservoir area. Sherrod-Apperson's Endsley 1, NW NW NE 6-2n-60w, pumped 25 barrels from Greenhorn sand, Upper Cretaceous 6112-30 and 6218-30 feet, completed 5-25-53, TD 6411.

COLORADO—OIL FIELD EXTENSION

Weld County, Long field. El Capitan Oil Co.'s Union Pacific 1, SW SW SE 23-12n-56w, 1-mile south extension, pumped 80 barrels oil and 190 barrels water from "D" sand, Upper Cretaceous 6222-28 feet, completed 5-21-53, TD 6500.

COLORADO—NEW GAS FIELDS

Logan County. Roden, Darden & McRae's Haywood 1, SW SE SE 6-11n-54w, flowed 4.0 million from "D" sand, Upper Cretaceous 5343-49 feet, completed 5-5-53, TD 5558.

Unnamed field. Roden, Darden & McRae's Monroe 1, NE NE NE 11-10n-54w, flowed 5.0 million from "J" sand, Upper Cretaceous 5072-5149 feet, completed 5-23-53, TD 5149.

Unnamed field. Skelly Oil Co.'s Colorado-A 1, SE SW 16-9n-52w, flowed 16.6 million from "D" sand, Upper Cretaceous 4497-4511 and 4515-23 feet, completed 5-24-53, TD 4752.

ILLINOIS—NEW OIL FIELD

Saline County, Eldorado, East field. G. L. Reasor's J. H. Porter 1, SW NW SE 23-8s-7e, pumped 250 barrels from Aux Vases lime, Mississippian 2910-15 feet, completed 5-5-53, TD 2915.

ILLINOIS—OIL FIELD EXTENSIONS

Clay County, Oskaloosa, South field. N. V. Duncan's R. Wyman et al 1, SW SE SW 8-3n-5e, ½-mile west extension, pumped 47 barrels from McClosky lime, Mississippian 2770-73 feet, completed 6-2-53, TD 2773.

Wayne County, Clay City Consolidated field. P. Fulk's J. E. Liston 1, SE NW NW 15-1s-7e, ½-mile extension, pumped 74 barrels oil and 10 barrels water from Aux Vases sand, Mississippian 3143-58 feet, completed 5-5-53, TD 3296.

Wayne County, Goldengate Consolidated field. Nash Redwine's J. Felix 1, SW NW SE 6-3s-9e, 1¼-mile extension, pumped 66 barrels oil and 40 barrels water from Aux Vases sand, Mississippian 3352-59 feet, completed 5-19-53, TD 3484.

White County, Iron field. Calvert Drilling Co. Inc.'s G. W. Mobley Community 1, NE SW SW 25-6s-8e, ½-mile extension, pumped 70 barrels oil and 137 barrels water from Tar Springs sand, Mississippian 2332-45 feet and from Bethel sand, Mississippian 2785-96 feet, completed 5-12-53, TD 3111.

INDIANA—NEW OIL FIELDS

Dubois County, Huntingburg, South field. Ed Steckler & A. W. (Slim) Rae's Frank Seufert 1, SE SW NE 32-3s-5w, flowed 440 barrels from McClosky lime, Mississippian 1078-83 feet, completed 4-20-53, TD 1088.

Posey County. Lloyd E. Kennedy & Hayes Drilling Co.'s E. C. Culley 1, NE SW SE 8-6s-14w, pumped 49 barrels from Tar Springs sand, Mississippian 2136-43 feet, and from Cypress sand, Mississippian 2509-17 feet, completed 5-13-53, TD 2517.

INDIANA—NEW OIL PAY

Posey County, Oliver, South field. Indiana Farm Bureau Co-op's Ida Moore et al 1, SW SW SW 10-6s-13w, pumped 151 barrels from Mansfield sand, Pennsylvanian 1436-45 feet, completed 5-13-53, TD 1445.

INDIANA—NEW GAS PAY

Dubois County, Huntingburg, South field. Truman W. Drake, et al's Luther Byers 1, SW SW SW 29-3s-5w, flowed 1.5 million from Cypress sand, Mississippian 806-24 feet, completed 5-20-53, TD 824.

KANSAS—NEW OIL FIELDS

Barton County, Ess field. Petroleum, Inc.'s Essmiller 1-C, NW SW SW 13-19s-14w, pumped 208 barrels from Lansing lime, Pennsylvanian 3326-35 feet, TD 3508.

Koopman field. Hanlon & Boyle's Koopman 1, NE NE NE 23-19s-13w, pumped 14 barrels from Arbuckle lime, Ordovician 3400-13 feet, TD 3404.

Pendergast field. Schermerhorn Oil Co.'s Pendergast 1, SW SW NE 27-19s-15w, pumped 106 barrels from Lansing lime, Pennsylvanian 3397-3402 feet, TD 3633.

Cowley County, Enterprise, Southwest field. Drillers Production's Godfrey 1, NW NE NE 3-34s-3e, pumped 42 barrels from Bartlesville sand, Pennsylvanian 3362-70 feet, TD 3370.

Decatur County, Pollnow field. Anderson-Prichard Oil Corp.'s Pollnow 1, NE NW SW 4-3s-29w, pumped 79 barrels from Lansing-Kansas City lime, Pennsylvanian 3734-41 feet, TD 4406.

Ellis County, Wheatland, Northwest field. Don Pratt's Stecklein 1, SE SE SE 12-15s-18w, pumped 45 barrels oil and 33 barrels water from Arbuckle lime, Ordovician 3568-72 feet, TD 3572.

Hodgeman County, Saw Log Creek field. Atlantic Refining Co.'s Hall 1, C NW SE 36-23s-22w, pumped 635 barrels oil and 44 barrels water from Marmaton lime, Pennsylvanian 4284-95 feet, TD 4982.

Norton County, Columbia field. Jones, Shelburne & Farmer's Lawson 1, SE SE NW 36-3s-24w, pumped 200 barrels from Arbuckle lime, Ordovician 3779-90 feet, TD 3790.

Pawnee County, Dunes, Southwest field. Westgate-Greenland Oil Co.'s Koelsch 1, SE NE NW 33-22s-15w, pumped 141 barrels from Lansing lime, Pennsylvanian 3728-36 feet, TD 4098.

Pratt County, Champlin Refining Co.'s Henderson 1, SW NE NW 11-26s-14w, pumped 28 barrels from Simpson lime, Ordovician 4360-66 feet, TD 4500.

Unnamed field. Champlin Refining Co.'s Henderson "B" 1, NE SE SE 10-26s-14w, flowed 237 barrels from Kinderhook lime, Mississippian 4246-52 feet, TD 4538.

Seward County. J. M. Huber Corp.'s Light Estate "C" 1, C SW SW 2-35s-32w, flowed 150 barrels from Morrow sand, Mississippian 5961-68 feet, TD 6327.

Trego County, Wakeeney, Northwest field. Imperial Drilling Co.'s Walker 1, SW NE SW 4-11s-23w, potentialed 2192

barrels from Lansing-Kansas City lime, Pennsylvanian 3725-33 feet, TD 4059.

KANSAS—OIL FIELD EXTENSIONS

Cowley County, Stayton field. Laura Jane Oil's Hoornback 1, SE SE NW 5-33s-4e, 1-mile southeast extension, pumped 240 barrels from Bartlesville sand, Pennsylvanian 3173-85 feet, TD 3189.

McPherson County, Lively field. John J. Darrah's Boese 1, SE NW NW 34-19s-2w, 1-mile south extension, pumped 108 barrels from Mississippi lime, Mississippian 2951-58 feet, TD 3000.

Meade County, Kismet, East field. Columbian Fuel Corp.'s Meyer 1, C SW NE 20-33s-30w, east extension, pumped 138 barrels from Mississippi lime, Mississippian 5698-5700 and 5710-16 feet, TD 6156.

KANSAS—NEW GAS FIELDS

Barber County, Nurse field. Champlin Refining Co.'s Nurse 1, NE NE NE 23-31s-13w, flowed 4.0 million from Douglas sand, Pennsylvanian 3599-3603 feet, open, TD 4705.

Harper County, Runnymede field. The Texas Co.'s Springer 1, NE NE SE 23-31s-6w, flowed 3.8 million from Simpson sand, Ordovician 4648-56 feet, open, TD 4819.

KENTUCKY—NEW OIL FIELD

Henderson County. Igleheart Drilling Co.'s E. A. Royster 1, in 6-N-24, pumped 45 barrels from McClosky lime, Mississippian 2539-51 feet, TD 2551.

KENTUCKY—OIL FIELD EXTENSION

Daviess County, Elbo, North field. J. C. Ellis-George Hoffman & Wallace Damron & Carl Morrison's Alonzo Ball 1, SW SE SE 22-0-26, ½-mile extension, pumped 375 barrels from Aux Vases lime, Mississippian 2174-84 feet, TD 2184.

NORTH LOUISIANA—NEW OIL FIELD

Concordia Parish, Buck Bayou field. Billups Brothers-Vasser & Brown's B. D. King et al 1, in 1-6n-7e, flowed 163 barrels from King sand, Eocene 5310-15 feet, 9/64-inch, 39.1-gravity, completed 5-7-53, TD 6010.

NORTH LOUISIANA—NEW OIL PAYS

Bossier Parish, Redland field. Continental Oil Co.'s R. C. Keoun 1, in 29-23n-12w, pumped 48 barrels oil and 106 barrels water from Pettit lime, Lower Cretaceous 6297-6307 feet, 42.2-gravity, completed 5-11-53, TD 7413.

Desoto Parish, Logansport field. Midstates Oil Corp.'s Mrs. Frankie Pyle 1, in 31-13n-16w, Old Well Worked Over, flowed 111 barrels from Lower Hill sand, Lower Cretaceous 5193-5210 feet, 12/64-inch, 39.5-gravity, completed 5-12-53, TD 6329.

NORTH LOUISIANA—OIL FIELD EXTENSION

Webster Parish, Springhill field. John B. Stephens, Jr. & A. O. Phillips' W. A. Griffin 1, C NW SE SW 2-23n-11w, 1-mile southwest extension, pumped 118 barrels from Tokio sand, Upper Cretaceous 3144-48 feet, 37-gravity, completed 5-19-53, TD 3148.

NORTH LOUISIANA—NEW DISTILLATE FIELD

Claiborne Parish, Blackburn field. Pan Am Southern Corp. & Sunray's B. M. Woods 1, NW SE 30-22n-8w, flowed 50 barrels distillate and 1.0 million from Bodcaw sand, Jurassic 8716-27 feet, 10/64-inch, 58.6-gravity, completed 5-15-53, TD 10,359.

SOUTH LOUISIANA—NEW OIL FIELDS

East Baton Rouge Parish, Essen area. Atlantic Refining Co.'s L. E. Morgan 1-A, in 53-7s-1w, Old Well Drilled Deeper, flowed 189 barrels from 10,054-060 feet, ½-inch, 49.7-gravity, completed 5-15-53, TD 10,406.

Rapides Parish. Midstates Oil Corp. & J. R. Butler's Heflands, Inc. 1, CW½ SE NE 23-2n-4w, pumped 50 barrels from Wilcox sand, Eocene 8591-93 feet, 45-gravity, completed 5-12-53, TD 8925.

SOUTH LOUISIANA—NEW OIL PAYS

Calcasieu Parish, Phoenix Lake field. Ohio Oil Co.'s E. W. Brown, Jr., 26, in 20-11s-13w, flowed 326 barrels from Upper Miocene sand 8494-8508 feet, 10/64-inch, 41.3-gravity, completed 5-19-53, TD 8587.

Iberia Parish, Vermilion Bay field. The Texas Co.'s State Lease 334-Vermilion Bay B-21, in 15s-5e, flowed 365 barrels from 12,370-387 feet, 10/64-inch, 39.1-gravity, completed 5-15-53, TD 12,877.

Lafourche Parish, Timbalier Bay field. Gulf Refining Co.'s Louisiana State Lease 1773-3, in 23s-21e, flowed 336 barrels from 11,946-954 feet, 10/64-inch, 35.4-gravity, completed 5-12-53, TD 13,455.

Plaquemines Parish, Quarantine field. Gulf's Louisiana State QQ-Quarantine Bay 14, in 8-19s-17e, Old Well Drilled Deeper, flowed 263 barrels from 9376-84 feet, 9/64-inch, 34.2-gravity, completed 5-21-53, TD 10,000.

SOUTH LOUISIANA—NEW DISTILLATE FIELD

Cameron Parish, East Deep Lake area. The Superior Oil Co.'s Rockefeller-State Lease 2039-1, in 23-16s-3w, flowed 110 barrels distillate and 8.5 million from 14,000-020 feet, 22/64-inch, 45.7-gravity, completed 5-3-53, TD 14,542.

SOUTH LOUISIANA—NEW GAS FIELD

Plaquemines Parish. Richardson & Bass' Humble-Delacroix State Lease 1212-44-E, in 20-16s-14e, ungauged from 10,508-510 feet, completed 5-14-53, TD 12,236.

SOUTH LOUISIANA—NEW GAS PAY

Plaquemines Parish, Breton Sound field. Kerr-McGee Oil Industries, Inc.'s State Lease 1230-E-1, flowed 3.0 million from 4504-12 feet, ⅛-inch, completed 5-11-53, TD 7006.

MICHIGAN—OIL FIELD EXTENSION

Van Buren County, Bloomingdale field. Orville Palmer's Rosevear 1, SW SE SW 10-1s-15w, Columbia Township, west extension, pumped 25 barrels from Traverse lime, Devonian 1168-71 feet, TD 1171.

MISSISSIPPI—NEW OIL FIELD

Adams County, Shieldsboro field. Humble Oil & Refining Co.'s E. L. Hamilton Estate 1, in 8-4n-3w, pumped 34 barrels from Armstrong sand, Eocene 6503-06 feet, 35.6-gravity, completed 5-30-53, TD 7010.

MISSISSIPPI—NEW DISTILLATE PAY

Forrest County, Maxie field. Ohio Oil Co.'s Unit SW-31 1-T, in 12-1s-13w, 1½-mile southwest of production, flowed 104 barrels distillate and 4.2 million from Lower Tuscaloosa sand, Upper Cretaceous 8356-75 feet, ¼-inch, 59.3-gravity, completed 5-25-53, TD 8652.

NEBRASKA—NEW OIL FIELD

Cheyenne County. Chicago Corp. & Republic Natural Gas Co.'s State-Nichols 1, NE NE SE 36-14n-51w, pumped 25 barrels from "J" sand, Upper Cretaceous 4959-61 feet, completed 5-23-53, TD 4962.

NEW MEXICO—NEW GAS FIELDS

Lea County. Morris H. Antwell's Phillips Hooper 1, in 27-20s-37e, flowed 4.5 million from Queen sand, Permian 3502-3677 feet, 2-inch, completed 5-1-53, TD 3828.

Rio Arriba County. Phillips Petroleum Co.'s Indian 1-A, SW NE NE 29-29n-3w, flowed 0.4 million from Menefee sand, Upper Cretaceous 5635-5826 feet, completed 2-7-53, TD 5939.

Unnamed field. Phillips Petroleum Co.'s Unit (30-6) 1-9, SE NW 9-30n-6w, flowed 2.1 million from Mesaverde sand, Upper Cretaceous 5178 feet, completed 2-2-53, TD 5811.

San Juan County, West Kutz area. Benson & Montin's Riddle 1, SE NE NE 15-28n-13w, flowed 0.2 million from Pictured Cliffs sand, Upper Cretaceous 1716-35 feet, completed 5-15-53, TD 1791.

NEW MEXICO—GAS FIELD EXTENSIONS

Rio Arriba County, Blanco field. Phillips Petroleum Co.'s Mesa Unit (29-6) 2-14, NE SW SW 14-29n-6w, west extension, flowed 3.5 million from Mesaverde sand, Upper Cretaceous 5450-6270 feet, completed 4-22-53, TD 6270.

Unnamed field. Phillips Petroleum Co.'s Mesa Unit (30-6) 2-9, NE SW SW 9-30n-6w, ½-mile southwest extension, flowed 2.1 million from Mesaverde sand, Upper Cretaceous 5178 feet, completed 2-10-53, TD 5870.

NORTH DAKOTA—NEW OIL FIELDS

Bottineau County, Northeast Landa field. Ward-Williston Drilling Co.'s Bert Klokstad 1, C NE NW 36-164n-79w, pumped 65 barrels oil and 35 barrels water from Mission Canyon lime, Mississippian 3073-81 feet, completed 5-20-53, TD 3081.

Westhope field. Zach Brooks Drilling Co. & Crawford E. Smith's Edwin Berentson 1, C SW SE 21-163n-80w, pumped 30 barrels oil from Charles lime, Mississippian 3352-85 feet, completed 5-8-53, TD 3633.

McKenzie County, Keene area. Amerada-Skelly & Pacific Western's George Wollan 1, C NW NW 15-152n-96w, flowed 36 barrels from Madison lime, Mississippian 9066-9110 feet, ½-inch, 43.2-gravity, completed 3-5-53, TD 12,379.

Mountrail County. Amerada Petroleum Corp.'s Clifford Rice 1, C NE NW 23-158n-94w, pumped 45 barrels oil and 40 barrels water from Madison lime, Mississippian 8364-86 feet, 32.7-gravity, completed 5-3-53, TD 8614.

NORTH DAKOTA—OIL FIELD EXTENSION

Bottineau County, Northeast Landa field. Cardinal Drilling Co. et al's Home-Stone 1, C SW NW 31-164n-78w, ¾-

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mile southeast extension, flowed 6 barrels from Mission Canyon lime, Mississippian 3065-74 feet, open, completed 4-28-53, TD 3074.

OKLAHOMA—NEW OIL FIELDS

Garfield County. Cities Service Oil Co.'s Hughes 1-B, C NW SE 27-4n-4w, flowed 150 barrels from Spring sand, Pennsylvanian 9007-35 feet, 40-gravity, TD 9705.

Garvin County, Purdy, Northeast field. Phillips Petroleum Co.'s Arnesen 1, C NW SE 2-3n-4w, flowed 145 barrels from Hart sand, Pennsylvanian 8650-86 feet, 10/64-inch, 42.3-gravity, and flowed 150 barrels from Springer sand, Pennsylvanian 9676-9758 feet, 16/64-inch, 36.3-gravity, TD 9920.

Unnamed field. Vickers Petroleum Co.'s Vera A. Crawford 1, NE NE 31-3n-3w, pumped 43 barrels from Springer sand, Pennsylvanian 9648-80 feet, 37.5-gravity, TD 9900.

Hughes County. Howard Hogan's Gilmore 1, SE SW SE 7-5n-9e, pumped 15 barrels from Upper Booch sand, Pennsylvanian 2596-2614 feet, 32-gravity, TD 2739.

Unnamed field. Ned Biffle Drilling Co. et al's Moore 1, SW SW SW 17-5n-9e, pumped 20 barrels from Booch sand, Pennsylvanian 2694-2700 feet and 2779-93 feet, 24-gravity, TD 2832.

Lincoln County. The Texas Co.'s Knack Heirs 1, C NW NE 7-13n-3e, flowed 25 barrels oil and 20 barrels water from Oswego lime, Pennsylvanian 4311-20 feet, TD 5336.

Unnamed field. W. H. Martgan's Orner 1, SE SW SE 31-17n-2e, flowed 89 barrels oil and 144 barrels water from Hunton lime, Devo-Silurian 4697-98 feet, and from 4702-07 feet, 25/64-inch, TD 5138.

Logan County. McConnell & Prior's Frey 1, NW NW SE 22-19n-2w, Old Well Drilled Deeper, pumped 84 barrels oil and 78 barrels water from 2nd Wilcox sand, Ordovician 5478-91 feet, TD 5580.

McCurtain County. Seay Bros. & Jack Woolsey's Harmon 1, SE SE NE 5-8s-23e, pumped 2 barrels oil and 40 barrels water from 332-335 feet, 26.5-gravity, TD 335.

Pawnee County. T. Blake Dirickson & D & L Oil Co.'s Grother 1, SE SE SE 18-17n-5e, flowed 20 barrels oil and 20 barrels water from Lower Skinner sand, Pennsylvanian 3552-60 feet, 24/64-inch, TD 3734.

Pontotoc County. Consolidated Petroleum, Inc.'s W. J. Mayer et al 1, NE NE SW 12-3n-7e, pumped 20 barrels from Thurman sand, Pennsylvanian 752-57 feet, 26.8-gravity, TD 760.

Pottawatomie County. Vaughn Production Co. & Amerada Petroleum Co.'s Settles 1, C SW SW SE 6-5n-3e, flowed 120 barrels from Layton sand, Pennsylvanian 3065-78 feet, 3/16-inch, 35-gravity, TD 3078.

Seminole County. Blackwood & Nichols Co.'s Jarvis 1, SE NW NE 8-10n-6e, flowed 432 barrels from Gilcrease sand, Pennsylvanian 3862-70 feet, 1-inch, 45-gravity, TD 4687.

Stephens County. Sohio Petroleum Co., Champlin Refining Co.'s Ringer Unit 2, SE NE SW 29-1n-4w, flowed 366 barrels from Spring sand, Pennsylvanian 5810-48 feet, ¼-inch, 37-gravity, TD 7110.

OKLAHOMA—NEW OIL PAY

Garvin County. Shell Oil Co.'s G. L. Rose 4, NW SW SE 6-1n-3w, pumped 112 barrels from Arbuckle lime, Ordovician 3571-3633 feet, 28-gravity, TD 3633.

OKLAHOMA—OIL FIELD EXTENSIONS

Garvin County. Antioch, Southwest field. Trans-Tex Drilling Co.'s Denson 1, C SE NE 17-3n-3w, flowed 322 barrels from Hartshorne sand, Pennsylvanian 7905-42 feet, 8/64-inch, 42-gravity, TD 8570.

Logan County, Unnamed field. Tom H. Prior & Fred McConnell's D. G. Randal 1, SW SW NW 24-16n-1w, Old Well Drilled Deeper, 1-mile southwest extension, flowed 37 barrels from Misener sand, Mississippian 5210-30 feet, 14/64-inch, TD 5633.

Oklahoma County, Britton field. Josaline Production Co.'s Glass 1, NE SE SE 18-13n-3w, flowed 20 barrels from Unconformed sand, Pennsylvanian 6417-35 feet, 40-gravity, TD 6547.

Osage County, Little Chief, Northeast field. Oras A. Shaw et al's Osage 1, C NW NE SW 1-25n-6e, flowed 65 barrels from Burbank sand, Pennsylvanian 2730-61 feet, TD 2770.

Pawnee County, Skedee field. Davidor & Davidor's James 1, NE SE SE 22-22n-6e, Old Well Worked Over, 1-mile northwest extension, pumped 70 barrels from Wilcox sand, Ordovician 3100-16 feet, 36-gravity, TD 3362.

Payne County, Garr, West field. Ned Biffle et al's Little 1, C NW NE NE 13-19n-4e, flowed 80 barrels from Skinner sand, Pennsylvanian 3351-59 feet, 6/64-inch, TD 3688.

Pontotoc County, Conservation field. Lee Evans, Shawver & Hailey's Myers 1, SE NE SW 15-5n-6e, flowed 20 barrels from Pennsylvanian sand 1730-36 feet, 12/64-inch, 33-gravity, TD 2866.

Pottawotomie County, Unnamed field. Otto M. Vaughn Production Co. et al's Vanschuyver 1-A, C NE NE SW 7-5n-3e, ½-mile south extension, flowed 40 barrels from Layton sand, Pennsylvanian 3017-28 feet, ¼-inch, 35-gravity, TD 3030.

Seminole County, Seminole field. Beach & Talbot's B. F. Davis 1, NE NW NW 17-9n-7e, ½-mile east extension, flowed 42 barrels oil and 5 barrels water from Hunton lime, Devo-Silurian 4122-54 feet, ½-inch, 41-gravity, TD 4413.

Stephens County, Loco field. Fitzgerald Bros.' Wood 1, NW NE SW NW 12-3s-6w, pumped 10 barrels oil and 1 barrel water from Pennsylvanian sand 1319-25 feet, TD 1508.

OKLAHOMA—NEW GAS FIELDS

Beaver County, South Forgan field. Carter Oil Co. & Stanolind's Oliver P. Kinnamon 1, C SE NE 23-5n-23ecm, flowed 2.9 million from Basal Morrow sand, Pennsylvanian 6486-6510 feet, TD 7081.

Unnamed field. Aladdin Petroleum Co.'s Cobb 1, C NE NE 16-6n-20ecm, flowed 9.6 million from Morrow sand, Pennsylvanian 6162-90 feet, TD 6450.

Coal County. Harry H. Diamond, Inc.'s Spence 1, NW NW SW 6-2n-8e, flowed 4.0 million from Cromwell sand, Pennsylvanian 910-936 feet, TD 1912.

Lincoln County. Mohawk Drilling Co.'s Anness Estate 1, NE SE NE 24-13n-5e, flowed 3.8 million from Prue sand, Pennsylvanian 3206-16 feet, ¾-inch, TD 4560.

TEXAS DISTRICT 1—NEW DISTILLATE FIELD

McMullen County, Hostetter, North field. Sunray Oil Corp.'s Stella E. Penn 1, AB&M Survey 55, flowed 390 barrels distillate and 26.0 million from Carrizo sand, Eocene 7828-43 feet, open, completed 5-5-53, TD 10,200.

TEXAS DISTRICT 1—DISTILLATE FIELD EXTENSION

McMullen County, Hostetter, North field. Sunray's D. H. Price 1, AB&M Survey, Section 53, ½-mile northeast extension, flowed 15 barrels distillate and 18.0 million from Carrizo sand, Eocene 7848-67 feet, open, 46.2-gravity, completed 5-24-53, TD 8050.

TEXAS DISTRICT 2—NEW OIL PAY

Bee County, Tuleta, East field. Pontiac Refining Co. & Henderson Coquat.'s J. P. Harris 1, J. M. Urange Grant, Subdivision of J. M. Chittim Miller Ranch, flowed 17 barrels from Hockley sand, Eocene 3403-12 feet, 38-gravity, completed 5-14-53, TD 4945.

TEXAS DISTRICT 2—NEW DISTILLATE FIELD

Victoria County. Arnold O. Morgan's R. H. Welder A-1, SA&MG RR Co. Survey 10, flowed 1148 barrels distillate and 24.0 million from Upper Wilcox sand, Eocene 8599-8609 feet, open, and flowed 163 barrels distillate and 4.5 million from Lower Wilcox sand, Eocene 8710-15 feet, open, completed 5-1-53, TD 8806.

TEXAS DISTRICT 2—NEW DISTILLATE PAY

Live Oak County, White Creek, South field. F. B. Cochran Jr.'s Stephens 1, Simmons Subdivision, Section 74, flowed 130 barrels distillate and 13.0 million from Queen City sand, Eocene 5057-63 feet, open, completed 5-25-53, TD 5065.

TEXAS DISTRICT 2—DISTILLATE FIELD EXTENSION

Live Oak County, George West, West field. Atlantic Refining Co.'s Charles Bodden 1, Lot 2, George West Subdivision "C" J. Poitevent Survey 19, ½-mile northeast extension, flowed 247 barrels distillate and 8.6 million from Upper Wilcox sand, Eocene 7930-50 feet, open, 53.8-gravity, completed 5-13-53, TD 8070.

TEXAS DISTRICT 2—NEW GAS FIELDS

Jackson County. Maxima Oil Co.'s W. W. Moore 1, I&GN RR Survey, Block 1, Section 3, flowed 15.0 million from Frio sand, Oligocene 4670-76 feet, open, completed 5-11-53, TD 4748.

Karnes County. Forney & Winn's F. W. Kunkel et al 2, Don Erasma Seguin Survey, flowed 40.0 million from Upper Reklaw sand, Eocene 3928-39 feet, open, completed 5-20-53, TD 4015.

TEXAS DISTRICT 2—GAS FIELD EXTENSION

Refugio County, Woodsboro field. Republic Natural Gas Co.'s Wood 1, Refugio Town Tract, 2/3-mile northeast extension, flowed 2.8 million from Woodsboro sand, Oligocene 6368-76 feet, open, completed 5-19-53, TD 8823.

TEXAS DISTRICT 3—NEW OIL PAYS

Grimes County, Madisonville, South field. J. M. & Wesley W. West's Mrs. Belve Harrison 1, A. B. Dodson Survey, Old Well Worked Over, flowed 205 barrels from Dexter-Woodbine sand, Upper Cretaceous 9322-28 feet, 16/64-inch, 29-gravity, completed 5-24-53. TD 10,006.

Jefferson County, Big Hill field. Adams & Haggarty's Adams & Haggarty Fee 5-F,

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T&NO Co. Survey, Section 174, flowed 226 barrels from Upper Frio sand, Oligocene 7634-95 feet, ⅛-inch, 33.7-gravity, completed 5-8-53, TD 7814.

Spindletop field. Michel T. Halbouty's W. F. Weed 1, J. Douthit Survey, flowed 118 barrels from Lower Frio sand, Oligocene 4851-58 feet, 8/64-inch, 30.5-gravity, completed 5-23-53, TD 5088.

Wharton County, Duke field. Texas State Drilling Co.'s Henrietta Nilson 2, ETRR Survey, Section 11, 1-mile southwest of production, flowed 111 barrels from Miocene sand 6186-94 and 6197-6200 feet, open, 38-gravity, completed 5-25-53, TD 6382.

TEXAS DISTRICT 3—OIL FIELD EXTENSION

Galveston County, Galveston field. John W. Mecom's Maco Stewart "B" 9-B, W. K. Wilson Survey, 1-mile northwest extension, flowed 233 barrels from Frio sand, Oligocene 8908-12 feet, 12/64-inch, 33-gravity, completed 5-16-53, TD 9676.

TEXAS DISTRICT 3—NEW DISTILLATE PAYS

Brazoria County, Danbury field. Humble's Danbury Gas Unit 4-2, J. M. Hayes Survey, flowed 160 barrels distillate and 10.0 million from Frio 6-D sand, Oligocene 8597-8608 feet, open, 50.0-gravity, completed 4-22-53, TD 9500.

Liverpool field. Humble's J. F. Callihan Estate 1, Bradley & Hall Survey, flowed 600 barrels distillate and 23.5 million from Frio 25 sand, Oligocene 11,532-564 feet, open, 52.6-gravity, completed 4-13-53. TD 11,648.

Chambers County, Seabreeze field. Sun Oil Co.'s Seabreeze Land Co. 4, HT&B Survey 102, Old Well Drilled Deeper, flowed 348 barrels distillate and 19.0 million from Frio sand, Oligocene 9516-26 feet, open, 46.3-gravity, completed 5-19-53, TD 10,996.

TEXAS DISTRICT 3—DISTILLATE FIELD EXTENSIONS

Harris County, Katy field. Lee Bros. Oil Co.'s E. W. Peek 1, H&TC RR Co. Survey, Section 66, Block 2, ½-mile east extension, flowed 36 barrels distillate and 2.3 million from Cockfield-Yegua sand, Eocene 7109-11 feet, 14/64-inch, 53-gravity, completed 5-26-53, TD 7120.

Liberty County, Quinn field. Sohio Petroleum Co.'s Grogan Land & Lumber Co.'s 1, Ed B. Jackson Survey, 1-mile northwest extension, flowed 480 barrels distillate and 28.8 million from Cockfield "A" sand, Eocene 6057-59 feet, open, 58-gravity, completed 5-4-53, TD 7512.

TEXAS DISTRICT 3—NEW GAS FIELD

Galveston County, Caplen, North field. Sun's Humphreys et al 1, Reuben Barrow Survey, ungauged from Basal Miocene sand 5835-39 feet, completed 5-27-53, TD 10,300.

TEXAS DISTRICT 3—NEW GAS PAY

Wharton County, Trans-Tex field. Trans-Tex Transmission Co.'s R. B. Wallace 1, J. A. Hamilton Survey, Section 40, ungauged from Wallace sand, Miocene 2778-86 feet, completed 5-11-53, TD 5124.

TEXAS DISTRICT 4—NEW OIL FIELDS

Aransas County, "Puerto Bay" field. William H. Hunt Trust Estate's W. C. McCampbell 1, James Orick Survey, Block 58, Lot 16, flowed 194 barrels from Frio sand, Oligocene 6746-50 feet, 10/64-inch, 42.1-gravity, completed 5-23-53, TD 9029.

Duval County. John F. Camp's E. J. Miller 1, Diego Ynojosa Grant, King & Hillje Subdivision, flowed 36 barrels oil and 110 barrels water from Squire sand 3779-80 feet, 12/64-inch, 38.0-gravity, completed 5-2-53, TD 3798.

Jim Wells County. Sid Katz & W. E. Fox's Ray J. Ingram 1, Scott Resubdivision Benton Ranch, Section 3, Block 9, Lot 4, flowed 126 barrels from Middle King sand, Oligocene 5606-08 feet, ⅛-inch, 38.5-gravity, completed 5-25-53, TD 6508.

Nueces County, Red Fish Bay area. Sun's Corpus Christi State 443-1, Tract 443, flowed 93 barrels from 7284-88 feet, 11/64-inch, 37.2-gravity, completed 5-17-53, TD 7301.

Webb County. Hawn Bros. et al's Nancy de Spain et al 1, Survey 8, Block 2, pumped 42 barrels from Bruni sand, Eocene 2598-2605 feet, 46.0-gravity, completed 5-4-53, TD 2605.

TEXAS DISTRICT 4—NEW OIL PAYS

Nueces County, Shield field. F. B. Cochran Jr.'s J. O. Moore 1, Branigar Bros. Subdivision of Clarkson Ranch, Section 143, flowed 74 barrels from Miocene sand 3011-13 feet, ⅛-inch, 30.0-gravity, completed 5-2-53, TD 3013.

San Patricio County, Harvey field. La Gloria Corp.'s J. H. Harvey "A" A-1, Rincon Subdivision of Taft Farm land, Lot 8, flowed 135 barrels from Frio (13-A-1) sand, Oligocene 8613-25 feet, ⅛-inch, 39.9-gravity, completed 5-9-53, TD 9377.

Spartan field. Seaboard Oil of Del.'s J. M. Elliott 1, Welder & Odem Subdivision, Block 10, flowed 123 barrels oil and 12 barrels water from 8446-51 feet, ⅛-inch, 29.7-gravity, completed 5-18-53, TD 8813.

Starr County, Kelsey, South field. Humble's McGill Bros. A/C 2-187, La Blanca Grant, flowed 183 barrels from 7294-7306 feet, 9/64-inch, 41.8-gravity, completed 5-20-53, TD 7500.

TEXAS DISTRICT 4—OIL FIELD EXTENSION

San Patricio County, Old Ingleside field. Sunray's Hogg-Picton 1, John Robinson Survey, flowed 187 barrels from Frio (15) sand, Oligocene 8370-82 feet, 39-gravity, completed 5-9-53, TD 9350.

TEXAS DISTRICT 4—NEW DISTILLATE FIELD

San Patricio County. Plymouth Oil Co.'s R. H. Welder B-12, Eliz H. Welder Ranch Subdivision, Section 79, M. J. de la Garza Survey, flowed 31.0 million from 7395-99 feet, open, and flowed 51 barrels distillate and 1.3 million from 7644-48 feet, 11/64-inch, 61.4-gravity, completed 5-29-53, TD 8004.

TEXAS DISTRICT 4—NEW DISTILLATE PAYS

Hidalgo County, San Salvador field. Western Natural Gas Co.'s Carmen Gardenas de Cavazos 4, San Salvador Del Tule, Section 155, flowed 60 barrels distillate and 56.0 million from Frio sand, Oligocene 8980-95 feet, open, 48.0-gravity, completed 4-20-53, TD 8998.

San Patricio County, Lou Ella field. J. W. Gorman's B. W. Cox 16, M. P. H. & J. N. Delgado Survey, flowed 10 barrels distillate and 4.8 million from 4405-10 feet, 56.0-gravity, completed 5-2-53, TD 5067.

Spartan field. Spartan Drilling Co. et al's Chas I. Lovett 3, Welder & Odem Subdivision, Lot 5, flowed 145 barrels distillate and 3.5 million from Lower Frio sand, Oligocene 8760-72 feet, 49.8-gravity, completed 5-11-53, TD 9397.

TEXAS DISTRICT 4—NEW GAS FIELDS

Kenedy County, Murdock Pass area. Sun's Dunn-McCampbell 3, J. S. Boyle Survey, Padre Island, flowed 15.2 million from Marginulina 7300-14 feet, open, completed 5-17-53, TD 7340.

Unnamed field. Sun's Laguna State "A" 227-1, Subdivision of Laguna Madre Tract 227, flowed 17.2 million from 7254-70 feet, open, completed 5-1-53, TD 7341.

Starr County. L. M. Lockhart's J. D. Brock 1, Porcion 87, Block 11, flowed 0.8 million from Brock sand 2428-50 feet, open, completed 5-15-53, TD 2908.

TEXAS DISTRICT 4—NEW GAS PAYS

Aransas County, St. Charles field. Western Natural's H. H. McDowell 1, Sumpter Turner Survey, flowed 8.4 million from Upper Frio (A-1-S) sand, Oligocene 7616-24 feet, open, completed 4-20-53, TD 8334.

Hidalgo County, Landa field. Sinclair Oil & Gas Co.'s Schuster Unit 1, C. H. Swallow & Co. Subdivision of Alamo Land & Sugar Co., Lot 21, flowed 1.1 million from Upper Frio sand, Oligocene 5332-38 feet and 5340-50 feet, open, 69-gravity, completed 5-18-53, TD 8600.

TEXAS DISTRICT 5—NEW OIL FIELD

Navarro County. Lawton Oil Corp.'s A. V. Neal 1-A, in Sidney King Survey, flowed 156 barrels from Pettit lime, Lower Cretaceous 6828-6960 feet, 13/64-inch, 31-gravity, completed 5-7-53, TD 6960.

TEXAS DISTRICT 5—NEW OIL PAY

Freestone County, Stewards Mill field. Daniel Oil Co. Inc.'s Marjorie Watson Bass et al 1, in S. H. Bates Survey, old well worked over, pumped 35 barrels from Rodessa lime, Lower Cretaceous 7245-52 feet, 46-gravity, completed 4-15-53, TD 7980.

TEXAS DISTRICT 5—NEW DISTILLATE FIELD

Henderson County. C. E. Hyde & P. N. Wiggins & Pure Oil Co.'s Creslenn Ranch Co. 1, in William Keese Survey, flowed 600 barrels distillate and 10.3 million from Rodessa lime, Lower Cretaceous 7426-98 feet, and flowed 95 barrels distillate and 2.0 million from Pettit lime, Lower Cretaceous 8000-88 feet, open, completed 5-11-53, TD 8563.

TEXAS DISTRICT 6—NEW OIL PAY

Harrison County, Waskom area. Byrd Oil Corp. & Ed E. Hurley's Josephine Rogers 9, in Joseph Nations Survey, flowed 31 barrels from Pettit lime, Lower Cretaceous 5824-30 feet, ¼-inch, completed 5-11-53, TD 6334.

TEXAS DISTRICT 6—NEW DISTILLATE FIELD

Rusk County. Natural Gas & Oil Corp.'s R. C. Saxon 1, in John Welch Survey, flowed 235 barrels distillate and 6.2 million from Travis Peak sand, Lower Cretaceous 7372-87 feet, open, 61.5-gravity, completed 4-30-53, TD 7542.

TEXAS DISTRICT 7-C—NEW OIL FIELDS

Coke County. F. Kirk Johnson's Wendland 1, J. D. O'Daniels Survey, Section 8, flowed 95 barrels from Cisco sand,

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Schleicher County. Lone Star Producing Co.'s Joe Tisdale 1, Section 74, Block LL, TCRR Survey, flowed 121 barrels from Strawn sand, Pennsylvanian 5684-5710 feet, 16/64-inch, 42.2-gravity, completed 4-29-53, TD 5880.

TEXAS DISTRICT 7-C—NEW OIL PAYS

Runnels County, Cree-Sykes field. Henson Drilling Co.'s Enoch Johnson 1, Section 177, HT&B Survey, Old Well Worked Over, flowed 191 barrels from Morris sand, Pennsylvanian 3604-10 feet, 32/64-inch, 40.4-gravity, completed 5-13-53, TD 4310.

Hull-Dobbs, East field. S. C. Herring Drilling Co.'s W. D. Burford 1, G. W. Denton Survey 468, flowed 447 barrels from Upper Gardner sand, Pennsylvanian 3922-38 feet, ⅜-inch, 40-gravity, completed 5-20-53, TD 3994.

Jim Burt field. E. K. & E. M. Burt et al's Bendina Spill 1, J. R. Nunn Survey 338, flowed 192 barrels from Upper Gardner sand, Pennsylvanian 4076-87 feet, ½-inch, 42-gravity, completed 5-18-53, TD 4095.

Lindemann-McMillan field. Thomas D. Humphrey & Sons' C. F. Tounget 6-A, Section 32, Domingo Diaz Survey 532, flowed 117 barrels from Upper Gardner sand, Pennsylvanian 3838-57 feet, 20/64-inch, 41.2-gravity, completed 5-13-53, TD 3857.

Winters-Serratt field. Humble's John L. Barron 1, R. Clever Survey 52, flowed 114 barrels from Palo Pinto lime, Pennsylvanian 3668-82 feet, ¼-inch, 43.6-gravity, completed 4-25-53, TD 3682.

TEXAS DISTRICT 7-C—NEW DISTILLATE FIELD

Upton County. The Texas Co.'s Josephine Herbert Graf et al 1, Section 102, Block D, CCSD&RGNG Survey, flowed 544 barrels distillate and 6.6 million from Strawn lime, Pennsylvanian 9828-43 feet, 20/64-inch, 58.8-gravity, completed 5-27-53, TD 12,645.

TEXAS DISTRICT 8—NEW OIL FIELDS

Andrews County. Continental's F. T. McCollum & G. W. Weibusch 1, Section 24, PSL Survey, flowed 1560 barrels from Wolfcamp lime, Permian 8708-8950 feet, 1-inch, 42.6-gravity, completed 5-10-53, TD 9175.

Sterling County. P. L. Crandell's T. H. Humble 1, Section 30, Block 11, SPRR Survey, pumped 72 barrels oil and 30 barrels water from Glorietta lime, Permian 1479-81 feet, 30-gravity, completed 5-1-53, TD 1481.

TEXAS DISTRICT 8—NEW OIL PAYS

Andrews County, Andrews, Northeast field. Phillips' Texas University "CC" 2, Section 42, Block 5, University Lands Survey, flowed 1259 barrels from Ellenburger lime, Ordovician 13,828-853 feet, ¼-inch, 44.1-gravity, completed 5-3-53, TD 13,853.

Triple "N" field. Gulf's State "AR" 1, Section 21, Block 9, University Lands Survey, flowed 129 barrels from McKnight sand, Permian 5490-5525 feet, 12/64-inch, 29.6-gravity, completed 5-24-53, TD 5550.

Ector County, Penwell field. Phillips' Millard 2-A, Section 25, Block B-15, PSL Survey, flowed 709 barrels oil and 125 barrels water from Wichita Albany sand, Permian 6670-6700 feet, ¾-inch, 41.2-gravity, completed 5-30-53, TD 8961.

Pecos County, Pecos Valley field. Sinclair's Iowa Realty Trust 1, Section 21, Block 10, H&GN Survey, Old Well Worked Over, flowed 452 barrels from Fusselman lime, Silurian 5682-5732 feet, ½-inch, 42.1-gravity, completed 5-17-53, TD 8100.

TEXAS DISTRICT 8—OIL FIELD EXTENSION

Mitchell County, Westbrook field. Humble's James S. Trulock 1, Section 6, Block 28, T-1-S, T&P Survey, 1-mile south extension, pumped 118 barrels from Clearfork lime, Permian 3103-07 feet, 2-inch, 26.4-gravity, completed 5-27-53, TD 3107.

UTAH—NEW OIL FIELD

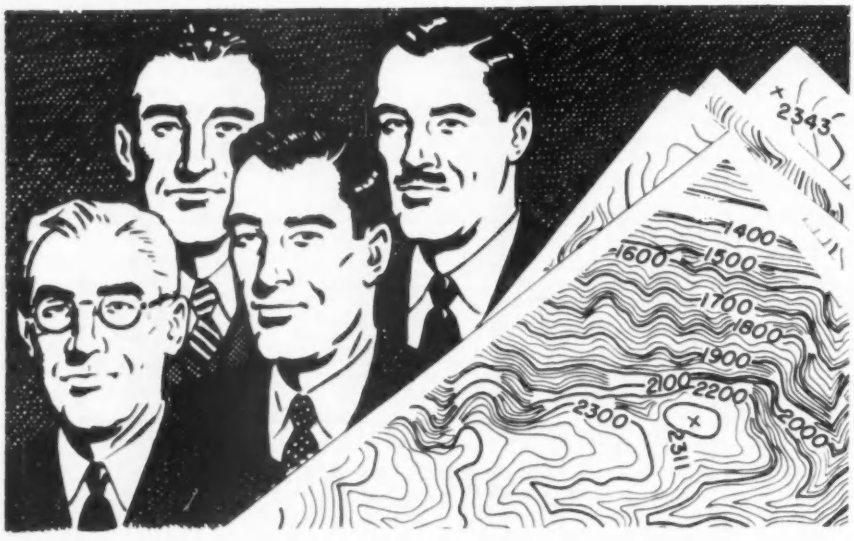
Duchesne County. Carter's Unit 1, C SE NW 25-3s-5w, flowed 239 barrels from Upper Green River lime, Eocene 5123-5225 feet, 24/62-inch, 23.7-gravity, completed 5-18-53, TD 5257.

WYOMING—NEW OIL FIELD

Hot Springs County, Walker Dome area. Forest Oil Co.'s Mill Iron & Cattle Co. 1, SE NE NE 8-46n-99w, pumped 120 barrels from Phosphoria dolomite, Permian 6646-78 and 6686-6750 feet, completed 4-27-53, TD 6964.

WYOMING—NEW OIL PAY

Johnson County, Sussex field. Continental's Sussex Unit 95-B, SW SW NE 23-42n-78w, pumped 420 barrels from Amsden lime, Pennsylvanian 8690-8788 feet, 32-gravity, completed 5-10-53, TD 9101.



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Do You Have a Problem Of Directional Drilling?

If so, this review of practices used in southern Louisiana will be helpful.

By W. H. COOK, Division Manager,
Eastman Oil Well Survey Company, Houston

OIL COMPANIES and independent operators in South Louisiana during the past few years have turned frequently to directional drilling techniques to tap oil producing horizons. The planning and execution of directional jobs and specific problems and practices now used in this area should be of interest and benefit to operators in other areas confronted with directional drilling problems.

Although execution of a job is of the utmost importance, no less important is adequate planning. It deserves special emphasis. Operators have come to realize the importance of joint planning of directional jobs before beginning actual work in the field. In many instances a qualified representative of the directional drilling company to do the work is included in the planning conferences. Others present are usually from the engineering, drilling and geological companies.

To facilitate discussion of the various points, assume a theoretical directional drilling job and how it should be planned and executed.

What Is Proper Target Tolerance? The first question to be decided is the desired bottom hole location of the deflected hole at the objective depth. This is a matter of geology and outside the scope of this article.

Another related geological factor which is being considered more often is the tolerance to be allowed in relation to this target. This is important —the proper evaluation of the objective tolerance can well mean a difference of several thousands of dollars in the drilling costs of the proposed hole. To illustrate—it is not at all unusual for a directional drilling company to be given an objective target in the form of a circle with a diameter of 50 feet, in fact 25-foot circles are not rare. At times such small targets are necessary because of proximity to lease lines, field spacing requirements, etc. However it should be remembered that as a rule additional deflecting tools will have to be set in order to achieve such an objective. Whenever a tool is set at appreciable depths it is as a rule 18 to 24 hours later before the crew can again be back on bottom with a conventional drilling hookup. The net result is sacrificing one day of rig time for 20 feet of hole, assuming that 20 feet of hole is made with the deflecting tool. Therein lies increased cost.

A 40-acre target should be the objective of all deviated holes. Where ever possible all practical latitude in regards to directional objectives should be allowed in order to increase penetration rates and thereby decrease drilling costs. Another reason for liberal objectives is that so-called straight holes frequently have a natural displacement on bottom which is much greater than the normally accepted tolerances on directional objectives. Still these straight holes are as a rule quite acceptable to the geological department concerned.

How to Select Kickoff Points? Once the objective has been decided the next item normally considered is the kickoff point or the depth at which the directional portion of the hole should be initiated. Since by nature the two problems vary somewhat, it probably will be better to discuss the selection of kickoff points for straight control work and sidetrack and control jobs separately to some extent.

By straight control work is meant those wells which are drilled to a predetermined depth at which point the directional hole is started in the natural formation. Sidetrack and control operations normally are started on a cement plug. Selection of these starting points is receiving more attention.

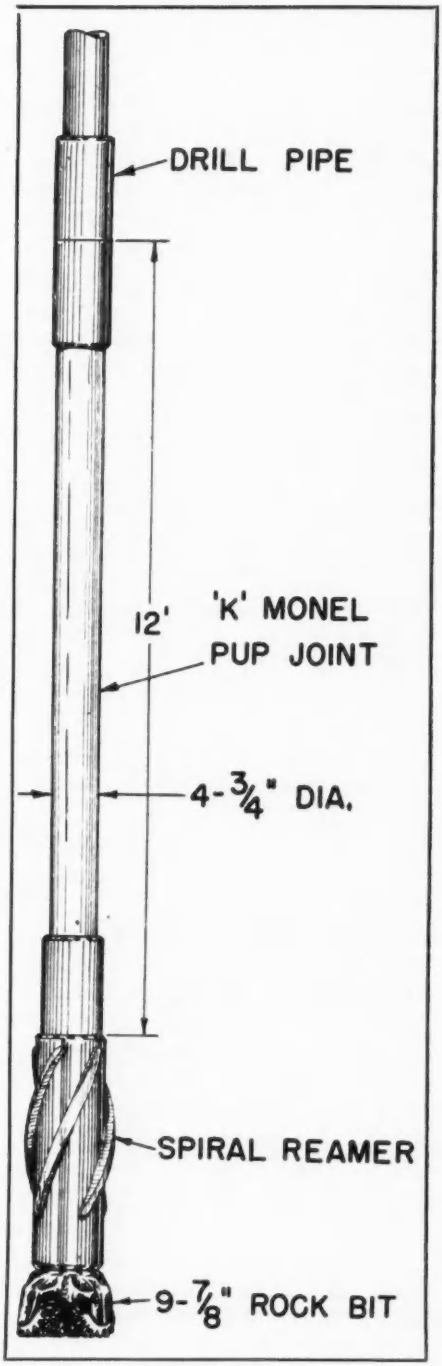


FIGURE 1.

In the past, the primary consideration was the amount of angle which would necessarily be carried to attain the desired deviation. Each company seemed to have a favorite angle at which to drill deviated holes. Most of those angles were comparatively low ones falling in the 5- to 10-degree range. A 15-degree hole was approached as a major undertaking. Subsequent experience has indicated to most companies that somewhat higher angles are preferable. Although much higher angles are not at all uncommon, most directional holes in South Louisiana at this time carry from 12- to 20-degree average angle.

Experience has demonstrated that these higher-angled holes have a greater stability of direction once the angle and direction has been established. As a result, fewer tools are set to correct drift direction. Since less footage is drilled, the work is done more quickly. Since the angle is introduced, wherever possible, by means of special drilling hookups rather than by the setting of primary directional tools, the holes are as a rule smooth and offer no undue mechanical difficulties. This last factor will be discussed in greater detail later in connection with drilling equipment and techniques.

In respect to their mechanical characteristics most holes in the 12- to 20-degree angular range are as a rule very similar. Hence it normally is considered to be of little import whether for example a 12-degree or and 18-degree hole is drilled. This one factor automatically allows a rather large leeway in the selection of the kickoff point. Most companies are taking full advantage of this leeway in order to locate the kickoff point in favorable formations.

What Formations Are Favorable for Side Tracking? Obviously the next point which should be considered is the exact nature of the so-called "favorable formation." Herein lies the basic difference between straight control and sidetrack and control work previously mentioned. Disregarding casing programs, which will be considered later, a straight control job can be started efficiently in almost any uniform formation provided this formation can be drilled at a reasonable rate of penetration.

It normally is considered prudent to avoid horizons which have alternating hard and soft streaks since it is difficult to build angle smoothly in such zones. The same would apply to highly faulted zones, as well as structural areas having a strong natural drift tendency contrary to the desired direction of deflection. When any or all these last three factors are known to be present, it generally is conceded desirable to approach them with a hole which is carrying the maximum angle desired and is also on course, directionally speaking. The maintenance of such an angle automatically offers the maximum possible resistance to variations in direction induced by these abnormal geological conditions as they are penetrated.

FIGURE 2

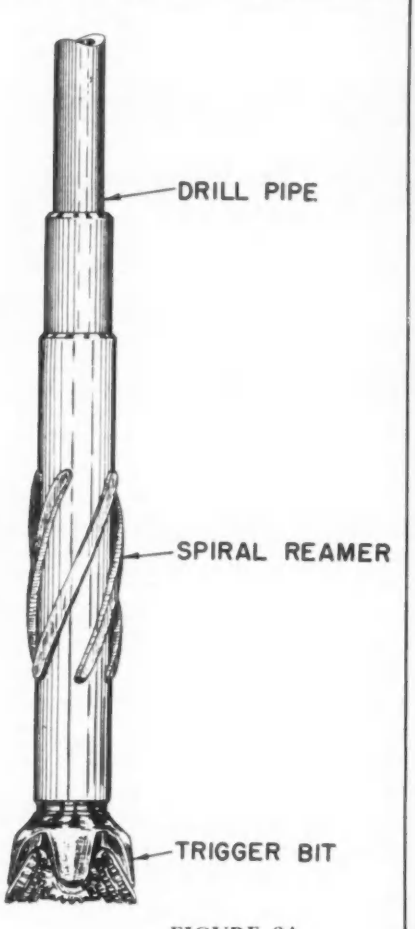


FIGURE 2A.

On long control jobs it is now the practice to plan the work so that the so-called buildup area of the deflected hole will be cased. This is accomplished as a rule by starting the deflection in the surface hole and if necessary setting a longer than normal string of surface casing. This practice eliminates to all practical purposes the danger of keyseating the drilling string in that portion of the directional hole most susceptible to this tendency.

Where to Start Side Track? The selection of the starting point for a sidetrack and control job is even more complex. In addition to those factors previously mentioned consideration must also be given to the gauge of the hole. Since all primary deflection tools are designed to work best in holes which are true to gauge, this is an important point.

For many years it was customary to select sticky shale bodies for sidetracking points. Subsequent experience with hole calipering equipment has demonstrated that it is in such sticky shale zones that holes are least true to gauge. Conversely speaking the holes are found to be much closer to true diameter in sand and sandy shale sections. It is therefore the normal policy to select such a zone for sidetracking purposes whenever it is possible to do so without necessitating the redrilling of major amounts of adtional footage.

In the general sense of the word it is ordinarily possible to do this in South Louisiana and still remain within the limits of the angular leeway previously mentioned. The decreased amount of time now required in most instances for sidetracking operations, as compared to those periods experienced a few years ago is perhaps proof of the efficiency of the methods outlined.

How Long Should Cement Set? Once the plug has been set, the next point for consideration is the proper time for and methods of testing the cement. There are many variables which affect the time of solidification

of a cement slurry. Since we are assuming normal well conditions in regard to depth, temperature, etc., extreme cases will not be considered. Some companies still wait 48 to 72 hours before testing. On the other extreme a 6 to 12 hour interval is preferred. Most operators plan to test the plug after 24 hours on the assumption that any plug will harden within that period. If the plug gives no indication of hardness, it is usually washed out of the hole and another plug is spotted as soon as possible.

Dressing a satisfactory plug, conditioning the mud thereafter, pulling out of the hole, and returning to bottom with the primary deflecting tools normally will consume approximately 12 hours. It is therefore readily apparent that a "24-hour" plug is usually 36 hours old before the actual sidetracking attempt transpires. Such an interval is normally sufficient. Obviously the underlying concern over this point is grounded within the desire to conserve rigtime to the fullest extent possible within the limits of efficiency. A day saved at this stage is as valuable as one which might be saved by any other means at any other depth.

What Method Is to Be Used? After the time interval has been decided the next logical point of consideration is the method and bit to be used in testing the plug. In most instances this is planned and executed by the operator's field personnel in cooperation with the directional drilling crew.

The primary deflecting tools now available for use may be classified under the headings of spud bits, whipstocks, knuckle joints and combinations of the latter two. Their characteristics are common knowledge and are not discussed in this article. Each type is a good tool and will as a rule achieve satisfactory results. The perfect, all-purpose tool has not as yet been made available. By this is meant a tool which invariably would produce maximum results under any and all hole conditions. With this thought in mind the most popular practice now is to, within limitations of company policy, leave the selection of the tool to be run in the hands of the local drilling superintendent and the directional driller. Since these men know the condition of the hole, etc., they should be capable of picking the proper tool for existing conditions.

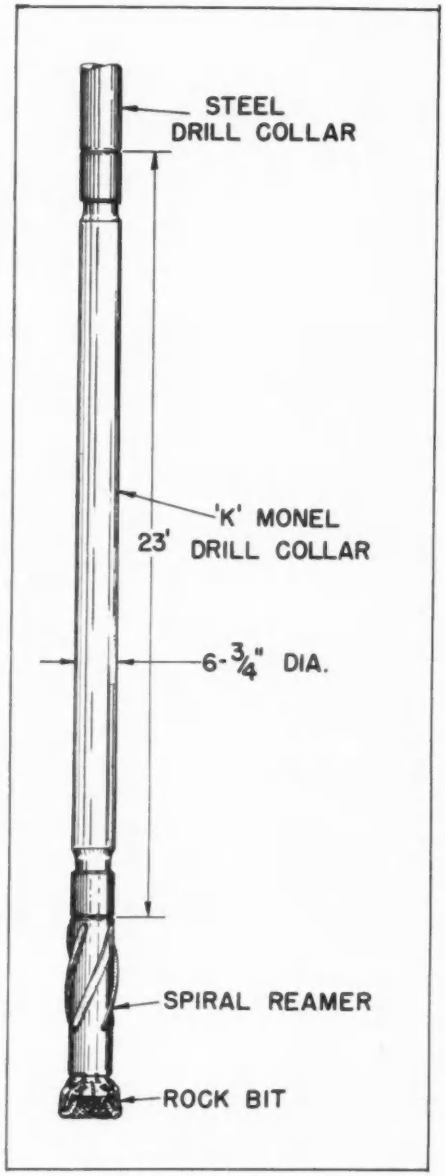


FIGURE 3.

Once the tool has been set and the desired footage drilled below the setting point it is customary to ream the so-called "rathole" to gauge with a pilot type reaming bit in those cases wherein the initial tool was set on a cement plug or in practically all instances whenever the tool used is of the "conventional" type. On straight control jobs it is as a rule customary to ream the ratholes drilled with full gauge tools with one of two basic drilling hookups.

One of these consists of a drilling bit suited to the formation, a bit stabilizer reamer, K-monel pup joint, and the drill pipe in use on the rig, (Figure 1). Such a drilling hookup has two basically desirable characteristics—the stabilizer reamer functions as a fulcrum point and in general causes a gradual increase of angle as additional footage is drilled. The 12- to 14-inch K-monel pup joint affords a means of checking the angle and direction without making a round trip with the drill pipe. This is done with an inside single shot picture taken in the approximate center of the pup joint. Such a picture is a correct assessment of the angle present in all cases. However the drift direction readings ordinarily acquire a proportionate error as the drift angle increases above approximately 8 degrees. This magnetic error is also a function of the course of the hole since it is greatest on due east or west bearings and smallest on due north or south headings. Additional data on this characteristic will be presented later in connection with K-monel drill collars.

Survey and Drilling Assembly. The second basic follow-up drilling assembly consists of a specialized survey or trigger-type drilling bit, a stabilizer reamer and the drill pipe in that order. This bit is designed specifically for directional drilling or surveying purposes. It is possible at any time when this bit is in use to lower, on a wire line or go-devil, an inside single shot surveying instrument. The weight of such an instrument and its protective case or barrel forces the trigger to swing open and permits the barrel to protrude through the bit for a predetermined distance sufficient to remove the encased instrument from the magnetic field of influence occasioned by the drilling string. This distance is governed by spotting an upset or dogknot type landing device near the top of the survey barrel which lands in the head of the bit (Figure 2-A).

The survey readings obtained below a trigger bit differ from those readings made within a pup joint or monel drill collar in the following respects; the angle in a trigger bit picture is subject to correction due to the droop in that portion of the barrel which protrudes through the bit. Correction tables have been made for this factor, however probably the best means to establish such a correction is to take a picture inside the

drill pipe immediately above the bit at a depth corresponding to that of a picture made with the barrel protruding through the bit. The directional readings in such pictures are correct in the magnetic sense provided that the instrument is spaced at a proper interval below the bit.

Another characteristic often deemed desirable is the greater degree of flexibility inherent with this assembly. This is most advantageous in shallow unconsolidated formations and at all depths where a rather fast rate of build-up is desired. The most confining characteristic of this last type hookup is its limitation to one basic bit design, although the bits are available with hard, soft and medium formation type cutters. The apparent advantage of both of these hookups is that they often permit an operator to enhance the initial tendencies introduced by the primary tools to the point of desired angle and direction without necessitating the setting of additional primary tools. Such a buildup is conceded to be the smoothest and most desirable mechanically.

Use of Stiffer Hook-up. After the angle and direction have been established it is customary to drill with a stiffer hookup consisting of a bit, stabilizer reamer, one or more drill collars and the drill pipe. If a K-monel drill collar is included any suitable bit can be used (Figure 3). Such a collar is not necessary if a trigger bit is in use. The errors in drift direction previously mentioned in connection with pup joints are also potential in K-monel drill collar survey readings. The difference being that readings obtained inside the latter are accurate at higher angles than those obtained inside pup joints. Again mechanical correction tables are available, still the most accurate correction can be established by means of an open hole or a trigger bit picture or a multiple shot survey. Such errors usually are consistent with the angle and direction present. Hence it is necessary to make such checks only occasionally provided the drift angle and/or direction does not appreciably vary.

Figure 3-A illustrates these factors since it is an actual plot of a monel collar survey and a magnetic multiple shot survey of the same hole. The consistent variation between the drift direction readings obtained by these two methods once the angle and drift direction were established is readily apparent.

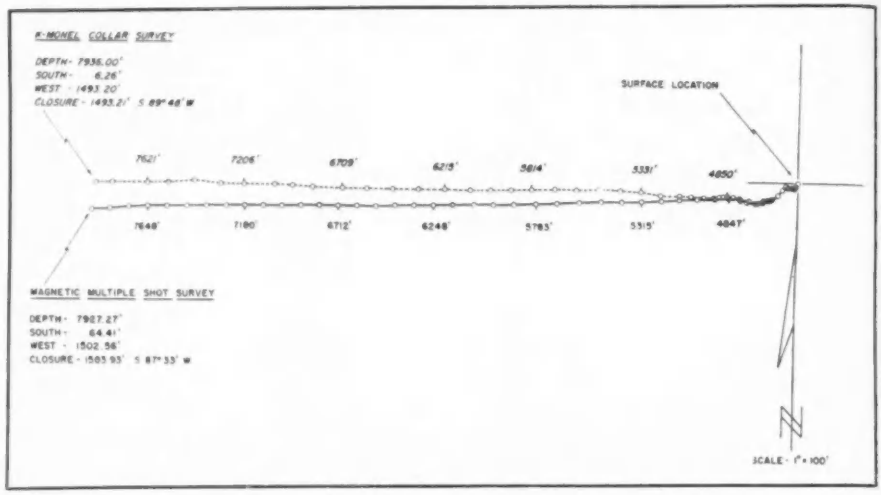


FIGURE 3A.

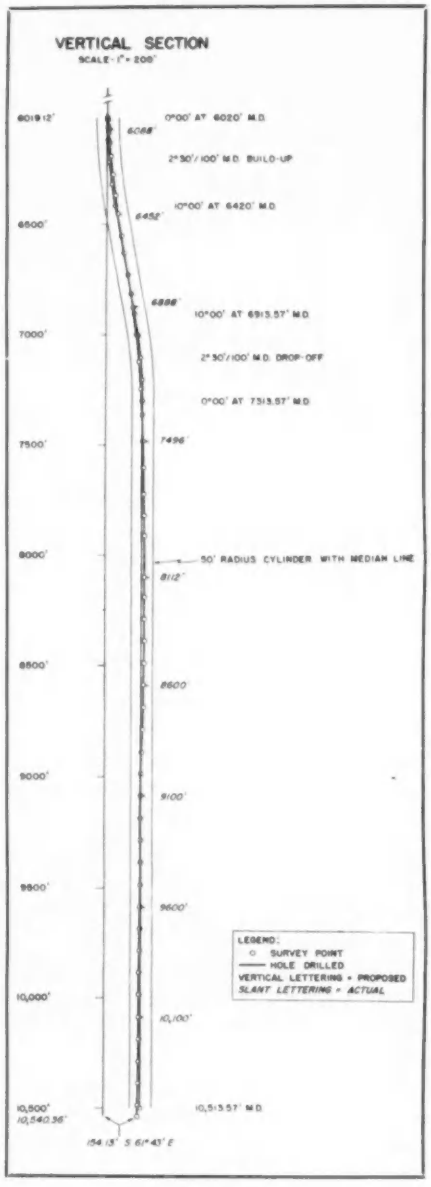


FIGURE 4.

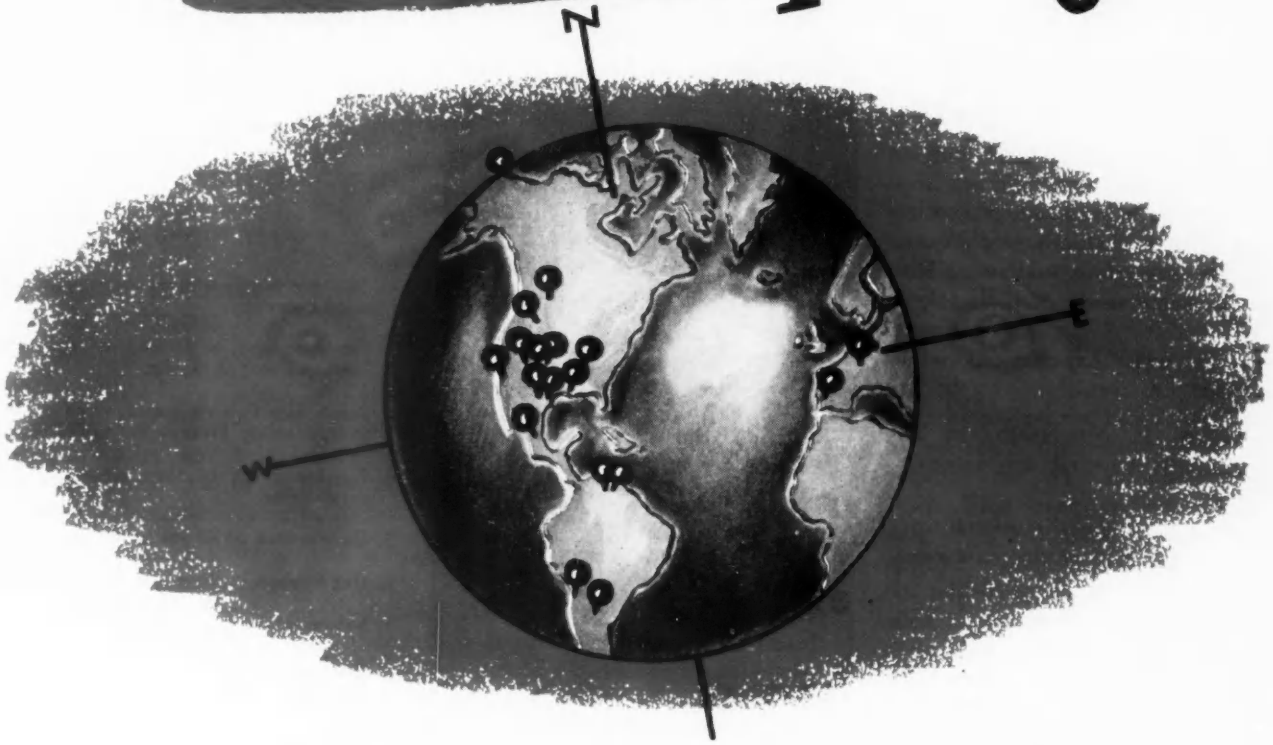
Use of Extension Sub. Another drill-drilling hookup which is gaining favor—particularly in connection with drilling through unfavorable zones—is the use of an extension sub between the bit and stabilizer. Such subs vary in length from 1 to 6 feet. It is ordinarily possible to select such an extension sub by trial and error that will materially aid in stabilizing the course of the bore hole.

Keyseats Always Hazardous. After approximately 1000 feet of deviated hole has been drilled the possibility of sticking the drill string in a keyseat is always present. One method of forestalling this is the setting of an intermediate string of casing at a point roughly 200 feet below the depth at which the maximum angle has been established. This has already been mentioned, and is probably the most effective means of counteracting this danger. Other precautionary measures involve the use of keyseat wipers and/or string reamers.

Opinion seems to be about equally divided concerning the relative merits of keyseat wipers and string reamers. Some persons swear by and others swear at each of them. Others swear at both and run both simultaneously.

String reamers are an effective means of reaming out keyseats provided sufficient weight of pipe is below the reamer to pull it into the high side of the hole. Ten or 12 stands (30-36 joints) of drill pipe are considered to afford sufficient weight to accomplish this. If both drill collars as well as drill pipe are below the

Wherever you go



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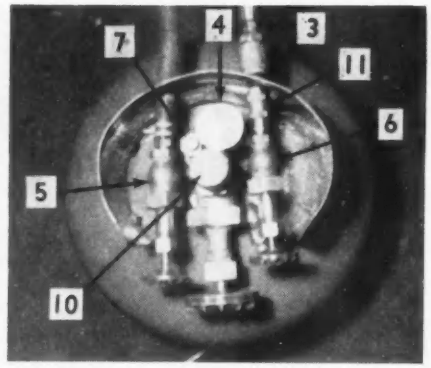
string reamer, less drill pipe is required. Due to the moment of inertia factor this last method considerably increases the danger of backing off a tool joint below the reamer during such an operation. Of course the normal method of use of a string reamer is to spot it in the string so that it will pass through potential keyseat zones as hole is being drilled. After the zone or zones have been so treated it is customary to leave the reamer out of the string until such time as indications of further keyseating are apparent.

Figure 4 is a vertical projection of a well which normally would occasion acute keyseating tendencies. Due to the judicious usage of both a keyseat wiper and string reamers no such difficulties were experienced while drilling it.

Conclusion. In conclusion the following points covered are summarized:

- Joint planning of directional work can in most instances decrease overall costs.
- The amount of angle present in directional holes within reasonable limits is not necessarily indicative of the mechanical qualities present. The rate in relation to depth at which this angle is introduced is the better criterion.
- The assignment of the most liberal directional objective commensurate with practical development is almost a sure-fire avenue to decreased directional drilling costs.
- Disregarding the amount of angle involved, the best mechanical holes are those in which the smallest number of tools are set.

The writer has not touched upon rig qualities, mud properties and has barely skimmed the surface of the question of casing programs. A fast rig is desirable since an abnormal number of trips are made. Adequate pumps which can be operated independent of the rotary are also a distinct advantage. On average jobs normal mud properties are sufficient so long as the hole remains open. On long jobs, oil emulsion or oil base muds afford many advantages. In general the casing program common to the area is sufficient. However on long high-angled jobs it is sometimes necessary to set intermediate strings. **—The End.**



KEY TO PHOTOS

1. Blow gun nozzle such as used on air hoses around garages.
2. Fifty-foot hose, or as long as required to reach any part of the rig.
3. Supply hose from air source, which operates clutches on rig. Pressure 110 to 120 pounds.
4. Pressure gauge to show air pressure on extinguisher.
5. Quarter-inch angle valve, 150 pounds test.
6. Quarter-inch angle valve, 150 pounds test.
7. Safety pop valve, 150 pounds.
8. Fifty percent liquid gauge. Valve which bleeds off liquid if 50 percent full. If tank is less than half full, air comes out.
9. Filler valve, ¾-inch, 150 pounds.
10. Filler cap to keep dirt and rain out of valve.
11. Check valve which permits air line to be disconnected so fire extinguisher can be moved in an emergency.

How to make a fire extinguisher from a propane bottle

A CANADIAN DRILLING contractor has made a fire extinguisher, that delivers 60 foot sprays, from used five-gallon propane bottles. Utilizing the 120-pound air pressure from the rig air source, the extinguisher may be used as a stationary or portable unit.

Fire fighting liquids such as pyrene or carbon tetrachloride, with an antifreeze additive for cold weather, are used. At the 120-pound pressure, a tank that is half full of liquid will empty itself in 2½ minutes of operation. In the event of a fire, all that is necessary to operate the extinguisher is to press the blow gun nozzle and direct the liquid to the base of the fire. Precautionary measures should be taken that the person operating the extinguisher should be in the open, i.e., if putting out a fire in a building such as a doghouse or light plant, the operator should stand outside while fighting the fire to avoid smoke and fumes.

The extinguishers are made by drilling a ¾-inch opening for a filler valve (9) in the top of the bottle, and ¼-inch openings for the pressure gauge (4), air inlet valve (3), pop valve (7), and a liquid discharge line (6). One-quarter-inch pipe collars are welded in all of the ¼-inch openings with the exception positions 5 and 8 where ¼-inch pipes extend near the bottom of the tank for liquid and one extending to the halfway mark for the 50 percentage gauge, respectivly.

The hose should be 50 feet in length or as long as may be required to reach major portions of the rig. A check valve is provided so that the air line may be yanked off and the fire extinguisher may be carried to any point in an emergency. The proper nomenclature is given in caption above.

Cut Costs in Crooked Hole Areas

- **. . . by carrying more weight and accepting larger deviation.**
- **. . . by using larger drill collars.**
- **. . . by using these charts to solve individual problems.**

By ARTHUR LUBINSKI, Stanolind Oil and Gas Company, Tulsa.
and **H. B. WOODS,** Hughes Tool Company, Houston

A STUDY OF THE factors affecting the angle of inclination and dog-legging in rotary bore holes has determined that the cost of drilling may be lowered in crooked-hole territories by:

- Carrying much more weight and deliberately accepting a larger deviation. (Large savings were made by carrying more than 30,000 pounds and letting holes go off as much as 17 degrees. In wildcats, the updip drift may increase the chances of discovery.) This does not result in sharper dog-legs. Such a method could not be used in steeply dipping formations because unreasonable deviation would result.
- Using larger drill collars with which more weight may be carried without increasing deviation. Examples: 8-inch collars in 9-inch hole, 11-inch collars in 12¼-inch hole.

Other conclusions were:

- Drilling a perfectly vertical hole with an elastic drilling string is impossible, even in horizontal formations, unless very low and uneconomical weights are carried.
- Extreme reduction in hole clearance, such as the use of several stabilizers in the lower part of the collar string results in:
  1. A decrease in the severity of dog-legs.
  2. A decrease in hole inclination in slightly dipping formations for heavy weights only.
  3. No decrease in hole inclination in steeply-dipping formations.
- Sudden large changes of weight in crooked-hole territories cause dog-legs and should be avoided. Any large change of weight should be graduated over a 15- to 30-foot interval.

EDITOR'S NOTE: Here are some new ideas regarding cutting costs of drilling exploratory wells. No new equipment is involved, just a revamping of drilling techniques. At Tulsa API meeting, where this paper was presented, comments based on field experience by others in the industry agreed with the findings presented. These comments will be published at the end of this article. Undoubtedly appreciable reduction in exploratory drilling costs will result in drilling more wells. Experience has shown that the more wells we drill the more oil we find.

One of the co-authors presented a paper on buckling of rotary drilling strings[1] at the 1950 API Mid-Continent Spring meeting. Later the other co-author pointed out that the previous study concerned a straight and vertical hole and suggested that a similar study be made for inclined holes—not only in homogeneous formations, but also in stratified formations, either horizontal or inclined. Here are the findings.

Part 1

Direction of Force on Bit. Consider a drilling string in a straight, but not vertical, hole as shown in Figure 1. At the vicinity of the bit, the string does not contact the wall of the hole. Some distance above the bit, the drilling string contacts the wall of the hole at a point designated as "point of tangency." Above the point of tangency, the string lies on the low side of the hole.

With no weight on the bit, the only force acting on the bit is the result of the weight of the portion of the string between the bit and the tangency point. This force tends to bring the hole toward vertical. When weight is applied, there is another force on the bit which tends to direct the hole away from vertical. The resultant of these two forces may be in such a direction as to increase angle, to decrease angle, or to maintain constant angle.

The relationship between the direction of the force on the bit and all the variables that affect it is plotted in Figure 2.

The derivation is based upon the assumption that the drilling string lies on the low side of the hole as shown in Figure 1. Actually, for some conditions, the drilling string will not lie along the low side, but will buckle helically. It will be shown later herein that in actual drilling conditions this situation occurs only exceptionally and the foregoing assumption is correct.

In this study, dynamic forces caused by rotation are disregarded. The justification for this is the fact that, as may be seen later, the conclusions are confirmed by actual field facts.

Consider first the example case of Figure 2, which refers to a drilling string with 6¼-inch collars in 8¾-inch hole. The upper abscissa is the angle of inclination α of the hole with respect to the vertical as shown in Figure 1. The ordinate is the ratio of the angle ϕ of the inclination of the force on bit to the angle α of the inclination of the hole (see Figure 1).

The curves correspond to various values of the weight on the bit. Consider, for instance, that 18,000 pounds are carried in a hole inclined 10 degrees. Point *D* of Curve 2 indicates that for these conditions ϕ/α is equal to 0.93, which means that ϕ is smaller than α and, consequently, the force on the bit tends to decrease the hole inclination.

For drill collars other than 6¼-inch and for hole diameters other than 8¾-inch, the lower abscissa scale of Figure 2 must be used. This abscissa represents the value of $\alpha\, m/r$, in which:

α is the hole inclination in radians (1 radian = 57.3 degrees)

r is the apparent radius of the hole

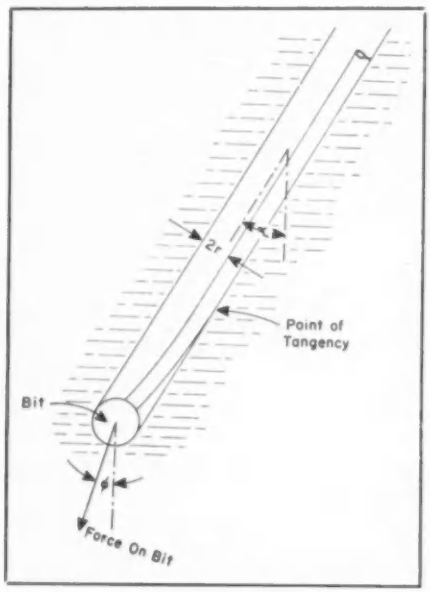
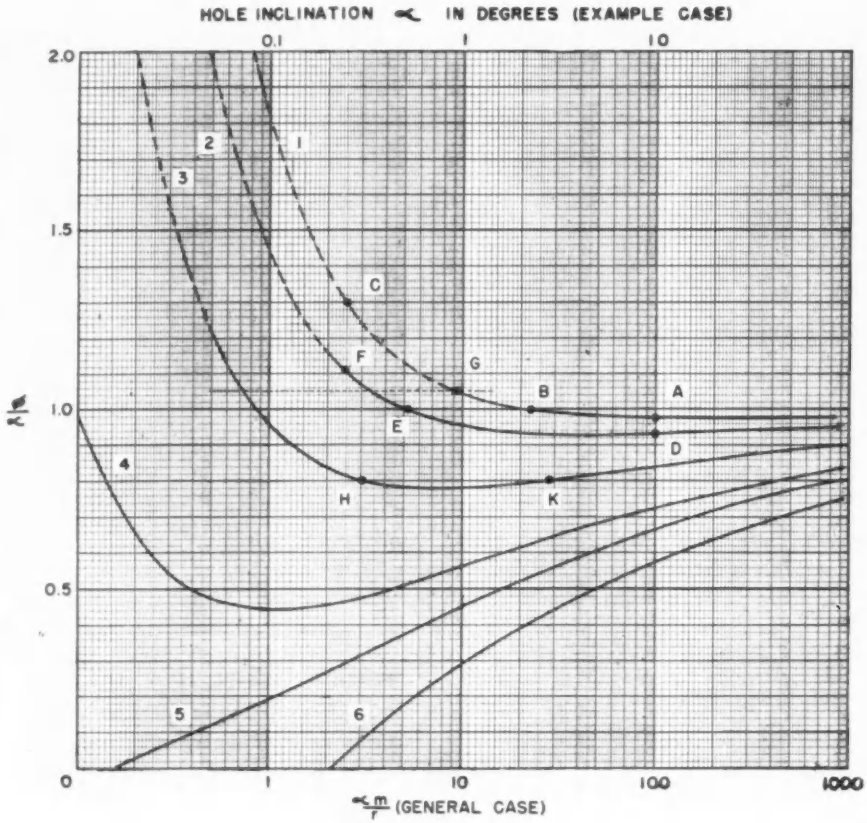


FIGURE 1.



Ratio Of Angle ϕ Of Inclination Of The Force On Bit Over Angle α Of Hole Inclination

FIGURE 2.

	CURVE					
	1	2	3	4	5	6
EXAMPLE CASE: 6¼" Drill Collars, 8¾" Hole, 10 Lb./Gal. Mud, Weight in Pounds	36,000	18,000	9,000	5,400	4,500	3,600
GENERAL CASE: Weight in Dimensionless Units	8	4	2	1.2	1	0.8

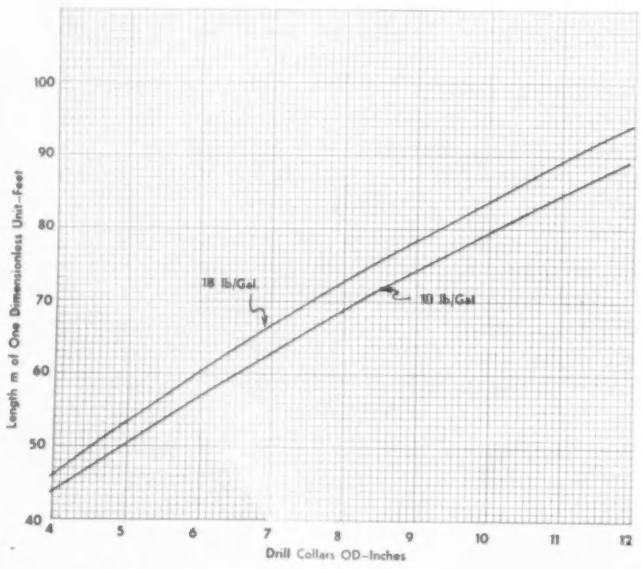


FIGURE 3. Length of m of one dimensionless unit.

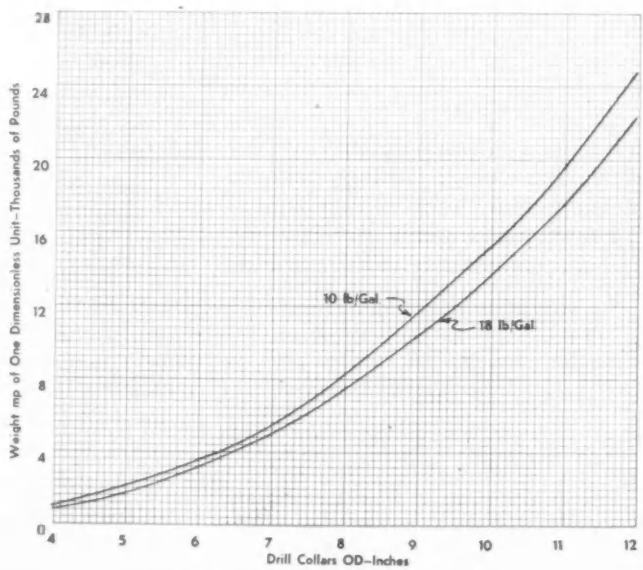
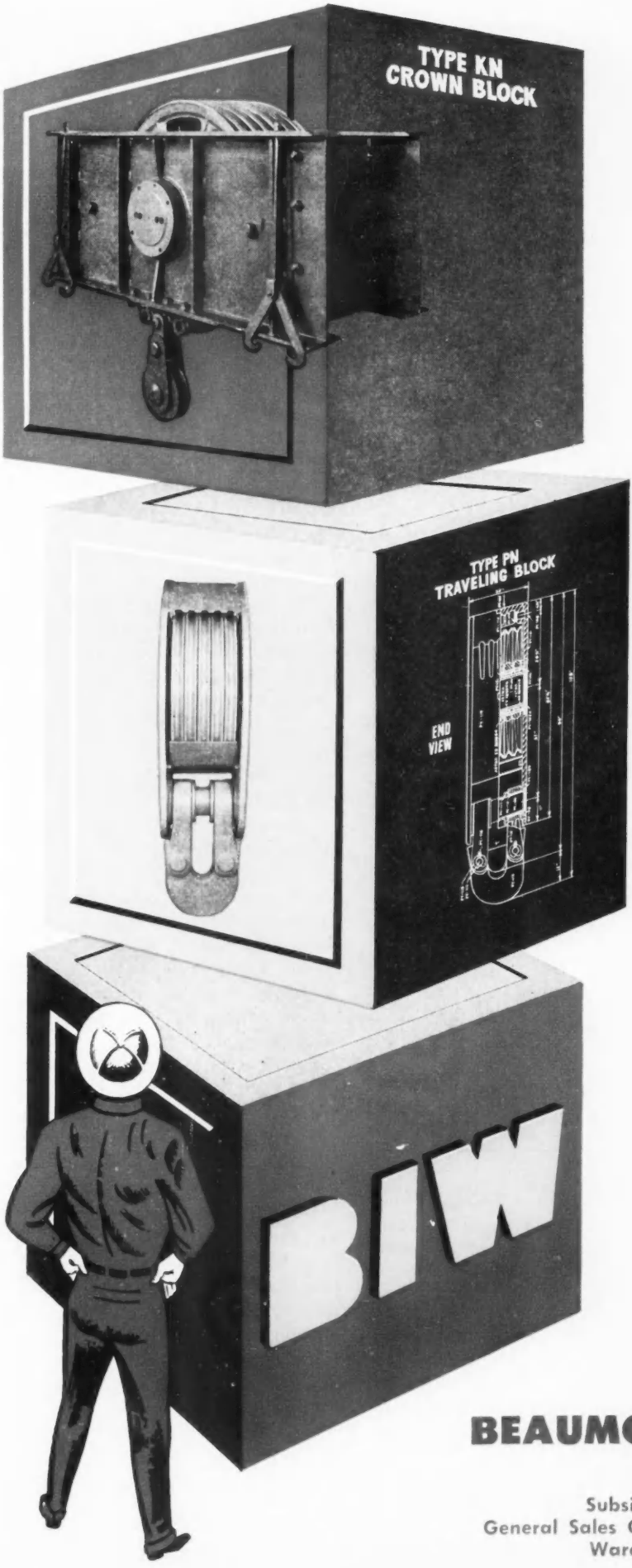


FIGURE 4. Weight of one dimensionless unit.



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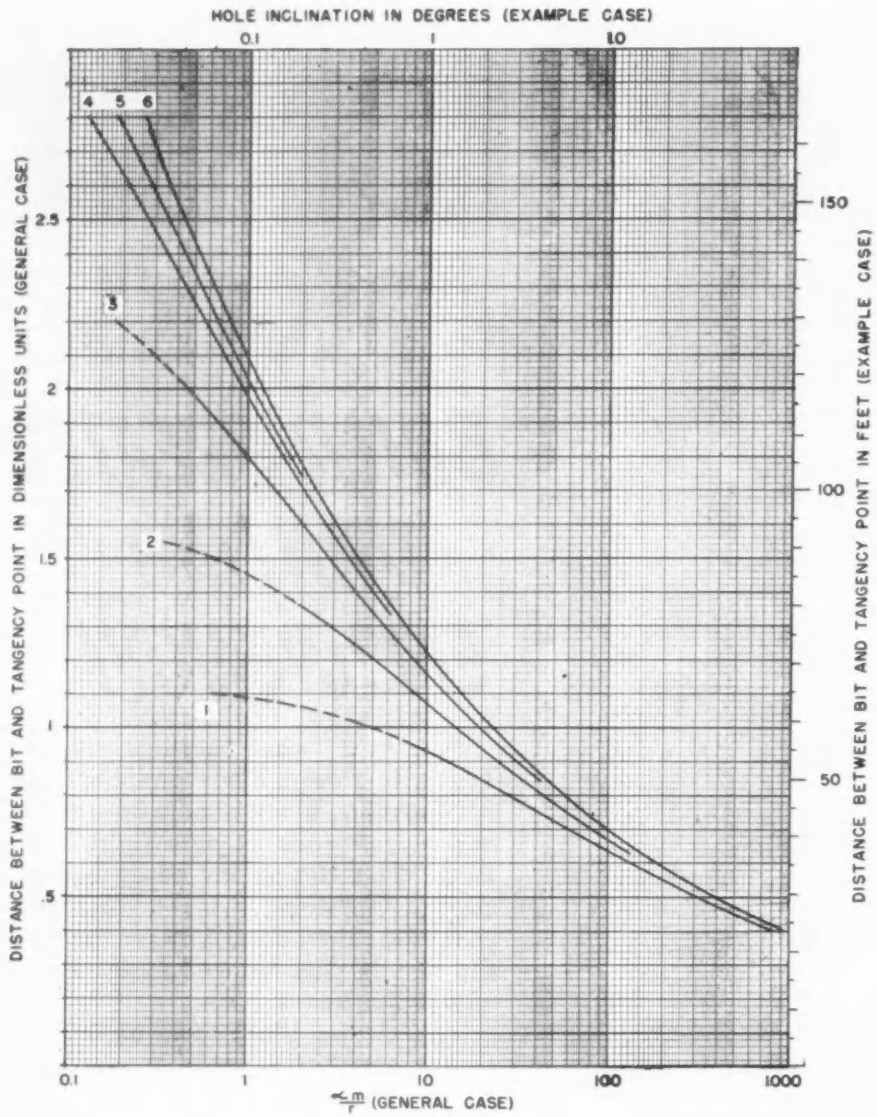


Location Of The Point Of Tangency

FIGURE 5.

	CURVE					
	1	2	3	4	5	6
EXAMPLE CASE: 6¼" Drill Collars, 8¾" Hole, 10 Lb./Gal. Mud, Weight in Pounds	36,000	18,000	9,000	5,400	4,500	3,600
GENERAL CASE: Weight in Dimensionless Units	8	4	2	1.2	1	0.8

in feet (one-half of diametral clearance between hole and collars)

m is the length in feet of the one dimensionless unit. Values of m are obtainable from Figure 3.

m depends upon the size of drill collars and buoyancy. Figure 3 was prepared from a formula given in a previous publication.[1] The inside diameter was assumed equal to 2¼-inch for 6-inch OD drill collars, and proportional to outside diameter for other sizes. The influence of inside diameter on values of m is, in any event, not very significant.

When using the lower abscissa scale, then various curves correspond to various weights on the bit, not in pounds, but in dimensionless units of weight. The weight of one dimensionless unit is given in Figure 4 for various sizes of drill collars and mud densities.

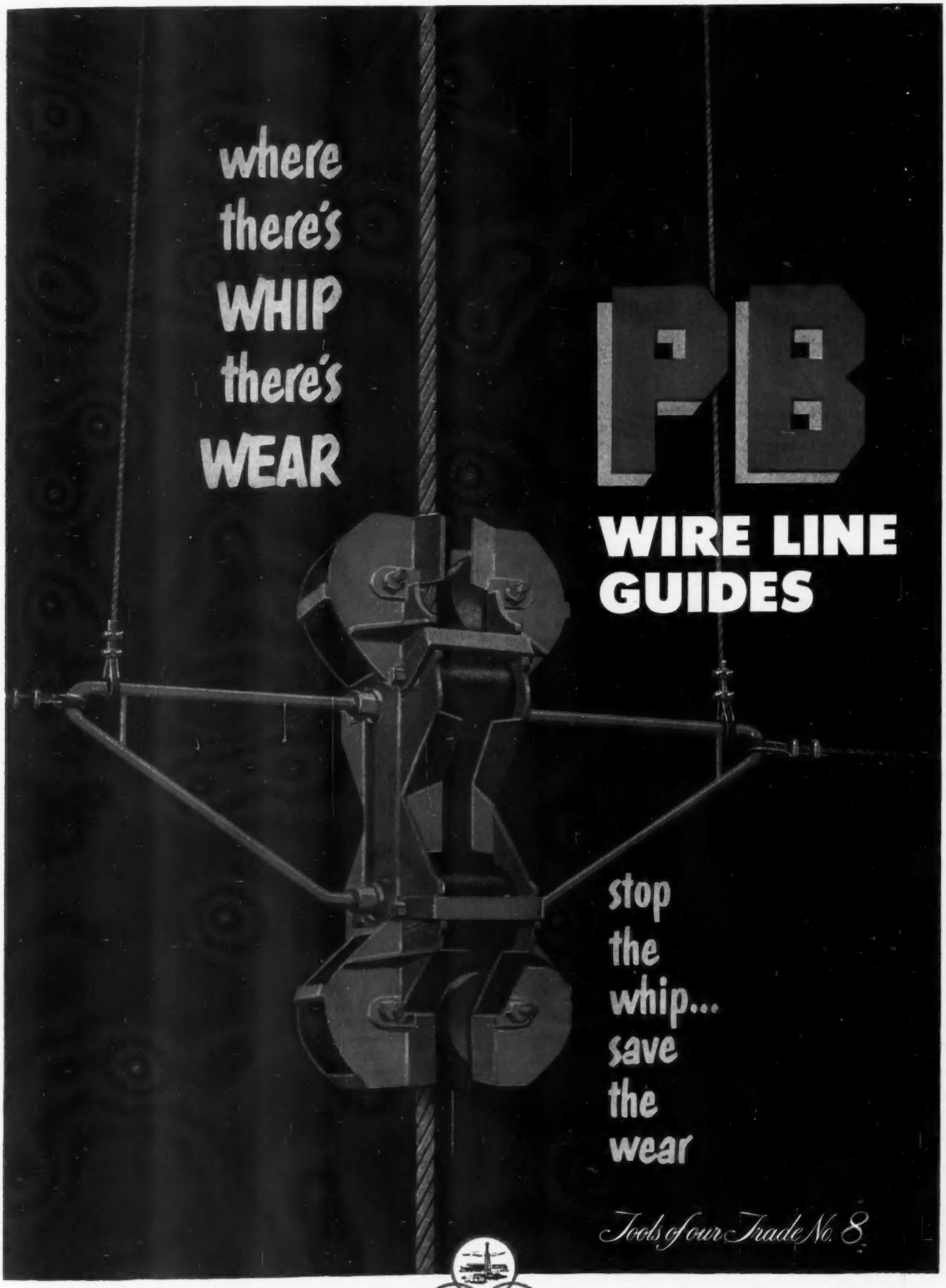
The location of the point of tangency is shown in Figure 5 in which the meaning of the two abscissa scales (general case and example case) are the same as in Figure 2 and the curves correspond to the same values of the weight on the bit. The left and right ordinate scales represent the distance between the bit and the tangency point in dimensionless units (general case) and in feet (example case), respectively.

Hole Inclination in Isotropic Formations. Assume that in a formation with no bedding planes, i.e., in an isotropic (properties identical in all directions) formation, a bit drills in the direction of the force which is imparted to it.

Consequently, the direction of the force on the bit given in Figure 2 becomes the direction in which the hole is drilled.

Consider, for instance, the condition represented by the point *A* of Figure 2. This point lies on Curve 1, for which the weight on the bit is equal to 36,000 pounds. The upper abscissa scale shows that the hole inclination is equal to 10 degrees. The corresponding value of ϕ/α, as seen in the ordinate scale, is less than unity. Consequently, when drilling ahead, the inclination of the hole will decrease. If the weight on the bit of 36,000 pounds is maintained, then the drilling conditions will be represented in succession by various points of Curve 1 located to the left of *A* until the condition represented by the point *B* is reached, for which $\phi/\alpha = 1$, which means that the hole inclination will not change any more. This inclination is equal to 2.25 degrees.

Consider now the case of the same weight on the bit as previously, but in a hole close to vertical, such as represented by the point *C*, for which the inclination is equal to 0.25 degree. This time, ϕ/α is greater than unity; and, while drilling ahead, the angle of inclination will build up and successive conditions will be represented by points of Curve 1 located to the right of *C* until again the condition represented by *B* is reached, for which the inclination is equal to 2.25 degrees. Thus, it may be seen that with 6¼-inch drill collars in an



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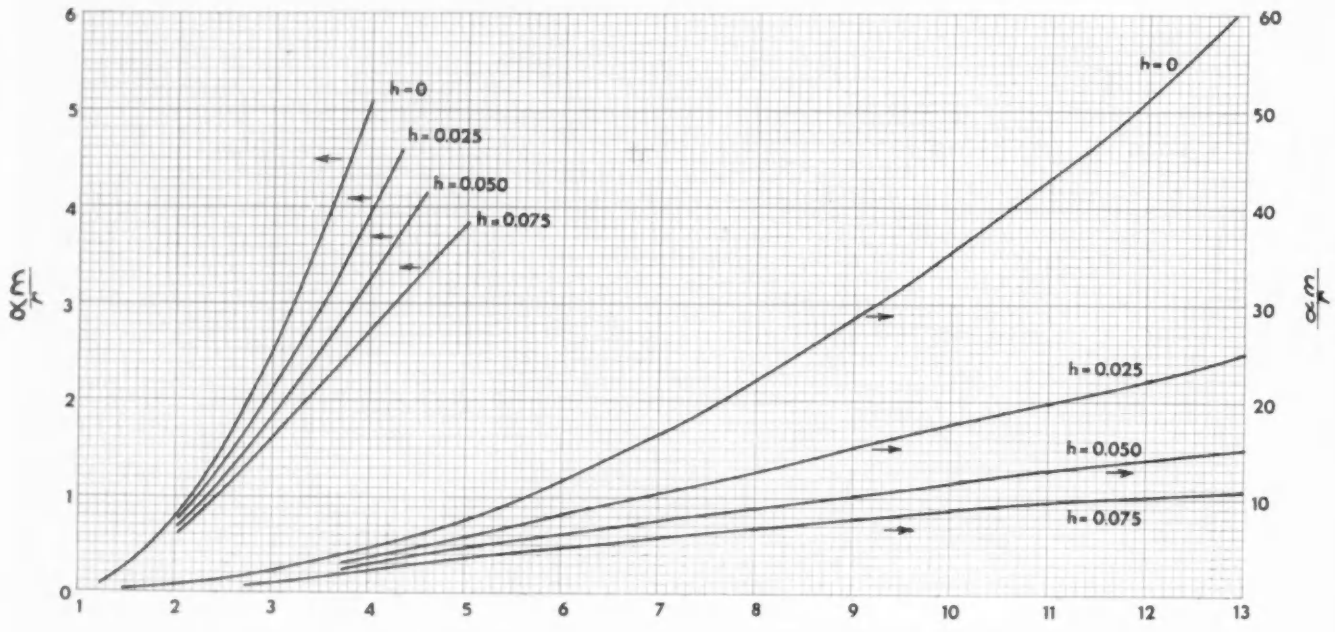


FIGURE 6. Inclination toward which hole tends (equilibrium angle) in non-inclined formations for various values of anisotropy index h.

8¾-inch hole and with 36,000 pounds on the bit, the hole inclination will approach 2.25 degrees irrespective of its initial inclination. In other words, point *B* corresponds to a stable drilling condition. The angle toward which the hole tends for a given set of conditions will be referred to as "equilibrium angle."

If, on the other hand, 18,000 pounds were carried instead of 36,000 pounds, then points *D*, *E*, and *F* of Curve 2 must be considered in place of points *A*, *B*, and *C* of Curve 1. Point *D* is located farther from the line $\phi/\alpha = 1$ than point *A*, which means that in a hole inclined 10 degrees, the tendency to bring the hole toward vertical is stronger for 18,000 pounds than for 36,000 pounds. Similarly, point *F* is located closer to the line $\phi/\alpha = 1$ than point *C*, which means that in a hole inclined 0.25 degree, the tendency to build up angle is smaller when 18,000 pounds are carried than with 36,000 pounds.

If 18,000 pounds are carried instead of 36,000 pounds, then Curve 2 shows that the angle of inclination toward which the hole tends is indicated by point *E* and is equal to 0.5 degree.

Curves 3 and 4 indicate that for the values of the weight equal respectively to 9000 and 5400 pounds, the inclination of the hole should tend to 0.09 and 0.01 degree, respectively; which, for all practical purposes, means a vertical hole. However, it is interesting to note that from a theore-

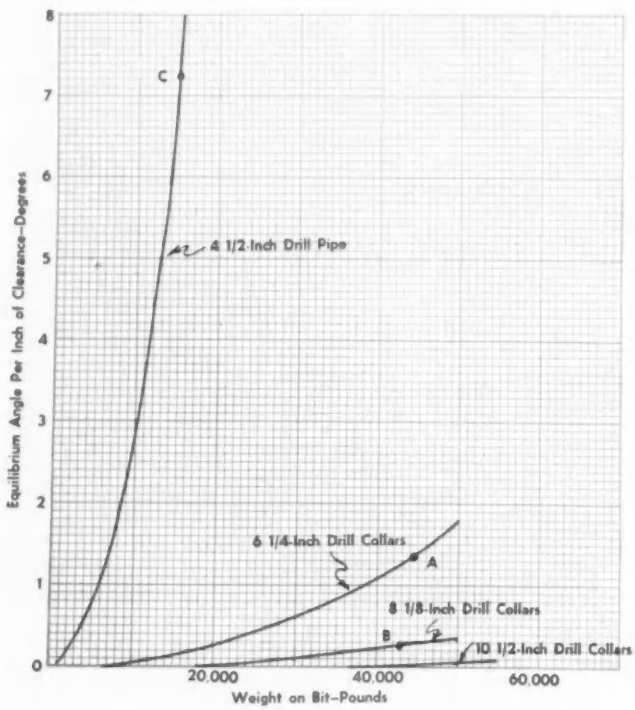
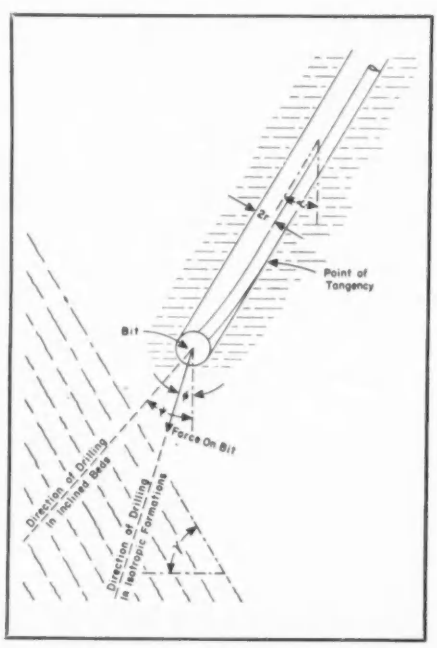


FIGURE 7. Inclination toward which hole tends (equilibrium angle) in isotropic formations.

FIGURE 8.



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tical standpoint for still less weight, e.g., 4500 pounds, as shown by Curve 5, the hole does not tend to any very small value of inclination, but comes to vertical.

In Figure 6 values of $\alpha m/r$ for equilibrium conditions taken from Figure 2 were plotted (curves $h = 0$) vs. the weight on the bit in dimensionless units. For a given size of drill collar, m is a constant and $\alpha m/r$ is proportional to the equilibrium angle per unit of apparent radius of the hole (half of the clearance). (The definition of h will be given later; $h = 0$ means that the formation is isotropic.)

Substituting numerical values for various sizes of drill collars and drill pipe in place of dimensionless values of Figure 6, curves of Figure 7 were plotted. Here the equilibrium angle in degrees per inch of clearance between collars (or tool joints) and hole was plotted vs. the weight on the bit in pounds for 6¼-inch drill collars, 8⅛-inch drill collars, 10½-inch drill collars, and 4½-inch drill pipe.

Consider, for instance, the case of 6¼-inch drill collars and 45,000 pounds on the bit. Point A of Figure 7 indicates that this inclination is equal to about 1½ degrees per inch of clearance between collars and hole, which corresponds to an inclination of $1.52 \times 2.75 = 4\frac{1}{8}$ degrees in a 9-inch hole. On the other hand, point B of Figure 7 indicates—for instance—that for 8⅛-inch drill collars, the hole tends toward an inclination of 0.3 degree per inch of clearance, which corresponds to only 0.26 degree in a 9-inch hole, as compared to 4⅛ degrees for 6¼-inch collars in the same hole. These examples show that holes drilled with large drill collars are much closer to vertical than holes drilled with the same weight and conventional collars.

Point C shows that carrying only 15,000 pounds with drill pipe and no collars at all results in an inclination greater than 7 degrees per inch of clearance or more than 20 degrees in a 9-inch hole, which explains the necessity for drill collars.

Although problems concerning hole inclination in inclined beds are much more important from a practical standpoint, it is interesting to point out that the common belief that holes go inclined only because of inclined formations or lack of symmetry of the drilling string are erroneous. Even in isotropic formation, a perfectly vertical hole cannot be drilled with an elastic drilling string, unless extremely small and uneconomical weights are used.

Drilling Anisotropy Index. Consider the case of a straight, but inclined, hole represented in Figure 8 and a set of conditions for which the force on the bit makes an angle with the vertical. It is well known that inclined bedding planes generally make the bit drill updip in hard rocks such as encountered in West Texas, Mid-Continent and Rocky Mountains. This is shown in Figure 8. Consequently, the direction of drilling is different from the direction of the force on the bit. For such to be the case, the formation must have a slightly lower drillability along the bedding planes than perpendicular to them. The relative difference of drillabilities parallel and perpendicular to bedding planes will be referred to herein as the "drilling anisotropy index" and will be designated by the symbol h.

h equal to zero corresponds to an isotropic formation. As it will become apparent later, observed field phenomena are explained by the use of values of h between zero and 0.075.

Hole Inclination in Anisotropic Horizontal Formations. It was previously shown that the conditions for maintaining constant angle of hole inclination (equilibrium conditions) for isotropic formations were obtained by the intersection of the various curves of Figure 2 with the horizontal line $\phi/\alpha = 1$. Similarly, the equilibrium conditions for anisotropic horizontal formations are represented by the points of intersection of the same curves with the horizontal line $\phi/\alpha = 1/1 - h$. ('Anisotropic' means with properties non-identical in all directions.) Consider, for instance, the case of $h = 0.05$. Then $\phi/\alpha = 1.0526$ (short dashed line in Figure 2). For a weight of 8 dimensionless units (36,000 pounds for 6¼-inch drill collars) the equilibrium conditions are represented by point G. As G is located to the left of B, the conclusion may be drawn that equilibrium angles are smaller in anisotropic horizontal formations than in isotropic formation.

Values of the ratio $\frac{\alpha m}{r}$ for equilibrium conditions vs. the weight on the bit in dimensionless units were plotted in Figure 6 in which various curves correspond to various values of the anisotropy index h.

Figure 6 shows that hole inclination may be two or three times greater in isotropic formations ($h = 0$) than in anisotropic horizontal formations.

Although the range of anisotropy indices in Figure 6 was obtained from a consideration of situations in dipping formation, the results obtained from the use of the same range of values explain the low hole inclinations obtained in anisotropic horizontal beds such as in Kansas where heavy weights may be applied on short drill-collar strings.—**End Part I.**

ACKNOWLEDGMENT

This article was taken from a paper entitled "Factors Affecting the Angle of Inclination and Dog-Legging in Rotary Bore Holes," by Lubinski and Woods and presented at the Spring meeting of the Mid-Continent Division of Production, API, in Tulsa, Okla., March 18-20, 1953. The paper has been slightly edited for publication and the appendix omitted due to space limitations. The experimental work was conducted in the Hughes Tool Company Research and Engineering Laboratory and the mathematical work was performed in the Research Department of the Stanolind Oil and Gas Company. The authors acknowledge their appreciation to both companies for permission to publish this article. They also thank the following for valuable help: T. W. Keating, chairman of API Mid-Continent Study Committee on Bore Hole Drift; W. A. Kistler, Hughes Tool Company; G. W. King, J. A. Muckleroy and J. C. Stall of Stanolind Oil and Gas Company; Peter A. Szego, The Rice Institute, Houston; W. W. Moore, British-American Oil Producing Company, and H. M. Rollins, Drilco Engineering Company.

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Although this paper as a whole is of value, one portion may mislead the reader, viz., the one concerning a straight-hole drilling technique by subjecting the drilling string to tension. This was shown in the following: Discussion by H. B. Woods to the paper by A. Klinkenberg "The Neutral Zones in Drill Pipe and Casing and Their Significance in Relation to Buckling and Collapse," *Drilling and Production Practice*, API, 1951; "Influence of Tension and Compression on Tubular Goods in Oil Wells" by Arthur Lubinski, Proceedings, of the Thirty-First Annual Meeting, API, Section IV, Production.

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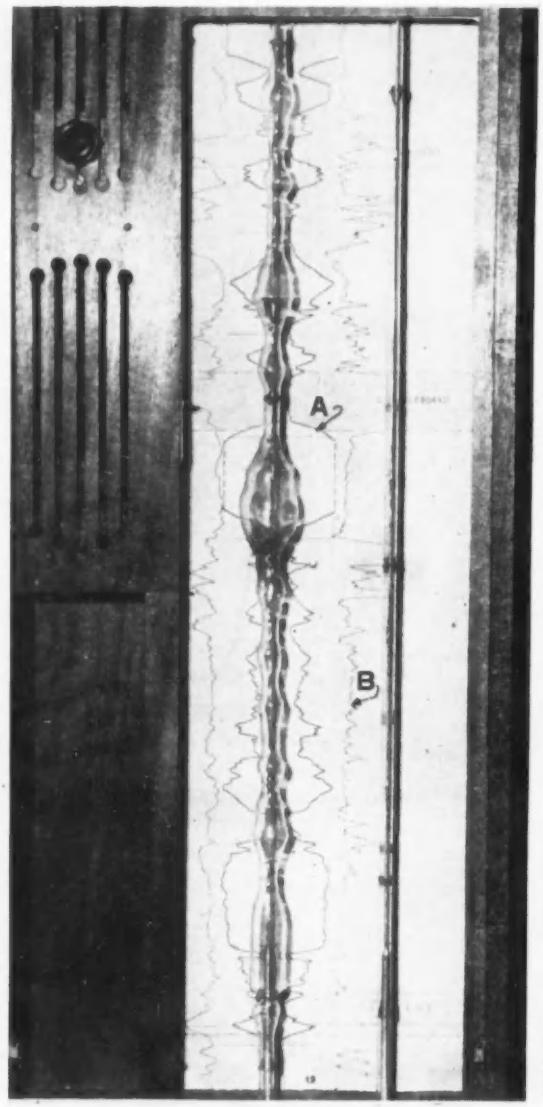


FIGURE 1.

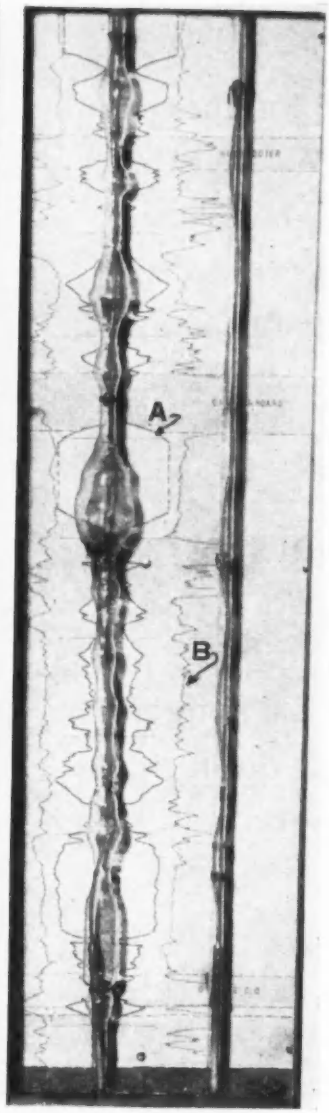


FIGURE 2.

Drilling model illustrates drill pipe action in rotary drill hole.

Here Are Factors Affecting Drill Hole Conditions

- Drill pipe action
- Makeup water
- Tripping with full hole
- Properties of flowing mud

By VICTOR HORNER, Mid-Continent Division Field Service Engineer Baroid Sales Division, National Lead Company, Tulsa, Okla.

WHY DOES ONE rig have hole trouble while a nearby rig using a similar mud is not experiencing the same trouble? An analysis of drilling practice could reveal the reasons.

The ultimate requirement for a mud is to provide a drilled hole that allows free travel of bits, testing tools and casing. Mud programs must be designed to meet this requirement. Other factors exist, however, that influence the condition of the hole. These factors are associated with the mechanics of rotary drilling and are not usually subject to control by the drilling mud specialists.

But a knowledge of these factors is necessary to recognize their effect upon hole conditions. Where such effects are detrimental, drilling practices should be modified instead of resorting to unnecessary changes in mud design.

Progress in drilling mud design is recognized as an important factor in the completion of oil wells. Greater demands are placed upon drilling mud as drilling depths increase:

- Formations are exposed for longer periods of time.
- Round trips with the drill pipe for exchanging bits and for running testing tools are increasing in number and require more time.
- Longer and thicker formations of sloughing shales, salt and anhydrite are encountered.
- Pressures and temperatures increase with depth.

All these factors demand continual improvement in mud materials, mud design, and mud treatment for providing adequate drilling fluids.

The mechanical factors and mud design that should be considered for maintaining desirable hole conditions are discussed here. Not all these considerations are new,[1] but their importance in drilling operations warrants review.

1. Drill Pipe Action

The mechanical action of rotating drill pipe depends upon the design of the drilling string, the weight transmitted to the bit, and the speed of rotation. Detailed studies have emphasized the importance of controlling this mechanical action for efficient and economical drilling.[2, 3]

In 1944, a drilling model[1] was built to illustrate drill pipe action in a rotary drill hole. (Figure 1). The model has been demonstrated in many parts of the country to show how some types of hole trouble develop from mechanical causes. The original model was designed to present problems associated with drilling the West Edmond Pool, Oklahoma County, Oklahoma.

This pool development occurred

several years ago; however, the same conditions which caused hole trouble at West Edmond exist in many localities. The model, therefore, is not obsolete; the same principles can be applied today. It is not intended that the model duplicate the action of rotating drill pipe, but only simulate such action for demonstration purposes.

The drilling model contains two glass tubes mounted in a wooden case. The right hand tube as shown in Figure 1, represents a gauge hole and the left hand tube is blown to represent a hole with enlarged sections. The left hand tube is superimposed upon a caliper survey record (A) and an electrical log record (B) of a typical West Edmond hole. Suspended within each tube is a section of speedometer cable which is manipulated through controls to simulate the effect that increasing weight on the bit and varying speed of rotation have on drill pipe action. The rigid section at the bottom of the cable represents drill collars and the five rigid sections spaced along the cable represent tool joints.

The drill stem assembly is fastened at the bottom through a bearing. The entire drill string is rotated by an electric motor through drives and the controls previously mentioned. The model does not display detailed drill string vibration patterns, but does emphasize the lack of rigidity inherent in conventional drill string assemblies.

Figure 2, shows the simulated drill stem in compression. Variation in the amount of compression during rotation causes changes in the action of the drill string. It is also evident that friction between the drill string and the walls of the hole affect drill string action. The drill string can be compressed so that it will rotate around its own axis just as though it were contained in a closely fitting curved conduit. Maximum stress reversals then occur at points of greatest curvature in the drill stem. These reversals cause metal fatigue at these points and explain a cause of twist-offs in the drill pipe.

The drill stem can also be compressed so that the string will rotate around the axis of the hole; maximum reversals in stress then occur at or near the top of the drill collar which is the transition point between flexible drill pipe and stiff drill collar.

This may explain a cause of twist-offs in this part of the drill stem. Also when the drill stem is rotated around the axis of the hole, only one side of some of the tool joints is in constant contact with the wall of the hole. In many cases, inspection of oil field drill pipe shows wear on one side of tool joints which could have been caused by similar rotating action.

The friction between the drill pipe and the wall of the hole reduces the force transmitted, to the bit, by the weight of the drill pipe. This reduction in weight is not evident in the reading on a weight indicator. The effect of wall friction on effective weight at the bit should, therefore, be recognized.

Operating Drill Pipe in Compression. Impact forces exerted against formations by drill pipe rotated in compression result in caving and hole enlargements. These results are aggravated when the shales are wetted and disintegrated by muds having high water losses.

The electric log and caliper surveys in Figures 1 and 2, show that the section of the hole under consideration consists of a series of enlargements in shale sections between three major limestone formations (Hogshooter, Checkerboard and Oswego). The degree of enlargement is proportional to the length of the shale sections. The caliper log shows that one enlarged section exceeds the caliper measuring capacity of 32 inches. The extensive development of these enlarged holes is indicated by cases where hydraulic wall hooks have been moved vertically and rotated freely through many feet of hole.

Hole trouble can result from the accumulation of cuttings and cavings in such hole enlargements. If disturbed, these accumulations can move from the enlargements into gauge portions of the hole to obstruct bit travel or to seize the drill pipe.

Long shale sections may be drilled with little trouble until a harder formation is encountered and additional weight is applied to the bit. Out of gauge hole will result if this weight comes from a portion of the drill pipe string rotating in compression against a shale section. Excess shale accumulation may be found at the shale shaker soon after the additional weight has been applied; bridges and cavings may be expected on succeeding round trips.

Operating Drill Pipe in Tension. Hole trouble may also be caused by operating the drill pipe in tension when long sections of shale are exposed in the bore hole.

When all the weight applied to the bit is equal to or less than the weight of the drill collars, the drill string above the drill collars is in tension. Such drilling weights are frequently necessary for drilling straight holes but can result in the drill pipe cutting into the wall of the hole to form 'keyseats' or 'wall-cuts.' The depth of a wall-cut depends upon the amount the hole deviates from vertical, the nature of the formation exposed to the cutting action of the drill pipe, and the length of time this action takes place.

Even though hole deviation is within prescribed limits,[4] wall-cutting is possible if the angle and direction of the hole change abruptly through long solid shale sections. Hard formations will resist the cutting action of the drill pipe and if they occur within a long shale section, these hard formations will serve as "bearing points" to hold the drill pipe away from the softer formation. Wall-cutting may be expected to occur in a crooked hole when a continuous shale section, more than one hundred feet thick, is exposed for more than 24 hours to the cutting action of drill pipe rotated in tension.

Stuck drill pipe or the accumulation of cavings in the hole may result from wall-cutting. The drill string, when pulled through a wall-cut during a trip out of the hole, may stick or scrape through the cut and dislodge shale which accumulates in the hole as cavings. These cavings may be encountered on the return trip to bottom or they may be evidenced only by appearance at the shaker after being circulated to the surface. Wall-cutting may be suspected as the cause of abnormal cavings immediately following a trip. This explanation helps to separate this cause of caving from others.

Hole trouble resulting from wall-cutting has been alleviated in actual drilling operations by periodically making a partial trip between full trips, pulling the bit to a point above the troublesome shale formation. This practice may wipe out wall-cuts before they become deep enough to cause

stuck drill pipe or excessive caving. In one area of southern Oklahoma, drilling of a shale section normally continues for more than 24 hours between trips. Here operations are interrupted after drilling each 125 feet of new hole and the bit is pulled to a point above the shale formation unless some hard formation has been penetrated. This practice corrected hole trouble without major alteration in mud properties.

2. Make-up Water

Proper selection of make-up water is important where good hole conditions depend upon good mud properties. The detrimental effects of sodium, calcium and magnesium salts on bentonite muds are well known. If such contaminants are derived mainly from the make-up water and if a bentonite mud is being used, a change to a better water can result in improved mud properties at lower cost. If the major source of contaminants, however, is in the formation drilled, and if the mud is designed to withstand these salts, hard make-up water can be used without impairing mud quality.

Because of this, it is difficult to classify make-up waters for adaptability under all conditions. Suitable make-up water may range in hardness and salinity depending upon the type mud in which it is used. Choice of water, therefore, depends upon the mud design selected for drilling in a particular area, and upon the mud properties required.

3. Keeping Hole Full On Trips

Failure to keep the hole full of mud 'on trips' is a source of hole trouble. Removal of the drill pipe from the hole results in a shorter column of mud and reduced hydrostatic head. This may permit entry of gas and water from shallow sands into the hole. The influx is more likely to occur as drilling depths increase because of the larger volume of drill pipe withdrawn.

Artesian water flows and shallow high pressure gas are usually recognized and the necessary steps taken to provide proper control. In many cases, however, the entry of water from the formation to the drill hole is so gradual that it is ignored. The accumulation of salts from a gradual influx can be harmful to the mud. Salts of sodium, calcium and magnesium from formation waters disturb desirable properties of fresh water bentonite muds; chemical treatment can become more difficult and costly. In some areas these shallow sands are unconsolidated and have been known to flow into the hole with the water. When this occurs bridges will be found upon running the pipe into the hole. It is important therefore to keep the hole full of mud during trips where necessary to control formation pressures.

4. Effect of the Properties of Flowing Mud on Hole Conditions

To avoid or overcome hole trouble, mechanical causes should be examined and corrected if necessary. One of the functions of drilling mud is to keep the hole clean by transporting cuttings and cavings to the surface. The ability of the mud to perform this function properly depends upon its weight, upward velocity, and flow characteristics.

These properties are subject to adjustment over a wide range and adjustments are frequently necessary to overcome hole conditions caused by poor drilling practice. In many cases the compensating adjustment is made at some sacrifice of other drilling mud functions and at greater mud treating cost. In some cases hole trouble cannot be corrected without eliminating the mechanical cause.

TRANSPORTING CUTTINGS THROUGH ENLARGED HOLE SECTIONS. The flow characteristics of drilling muds have been studied in an effort to determine the physical requirements for maximum carrying power.[5, 6, 7] Physical properties of the transported cuttings, such as shape, size and density influence the rate at which the cuttings can be removed under any given set of flow conditions. These factors deserve recognition when any correction of hole condition is considered. The three types of flow patterns exhibited by drilling muds are: streamline, turbulent and plug. Drilling muds can be expected to move in one of these patterns depending upon the physical properties and velocity of the mud.

In streamline flow, fluid velocity increases from the edge to the center of the flow stream. At the outer edge of the stream where there is considerable friction between the wall and the stream, the mud moves slower than it does nearer the center of the stream. This flow pattern is characterized by a "channeling effect" with the mud moving faster at the center than near the walls.

In turbulent flow, the mud moves in eddies and is characterized by a wide, agitated flow pattern that prevents channeling.

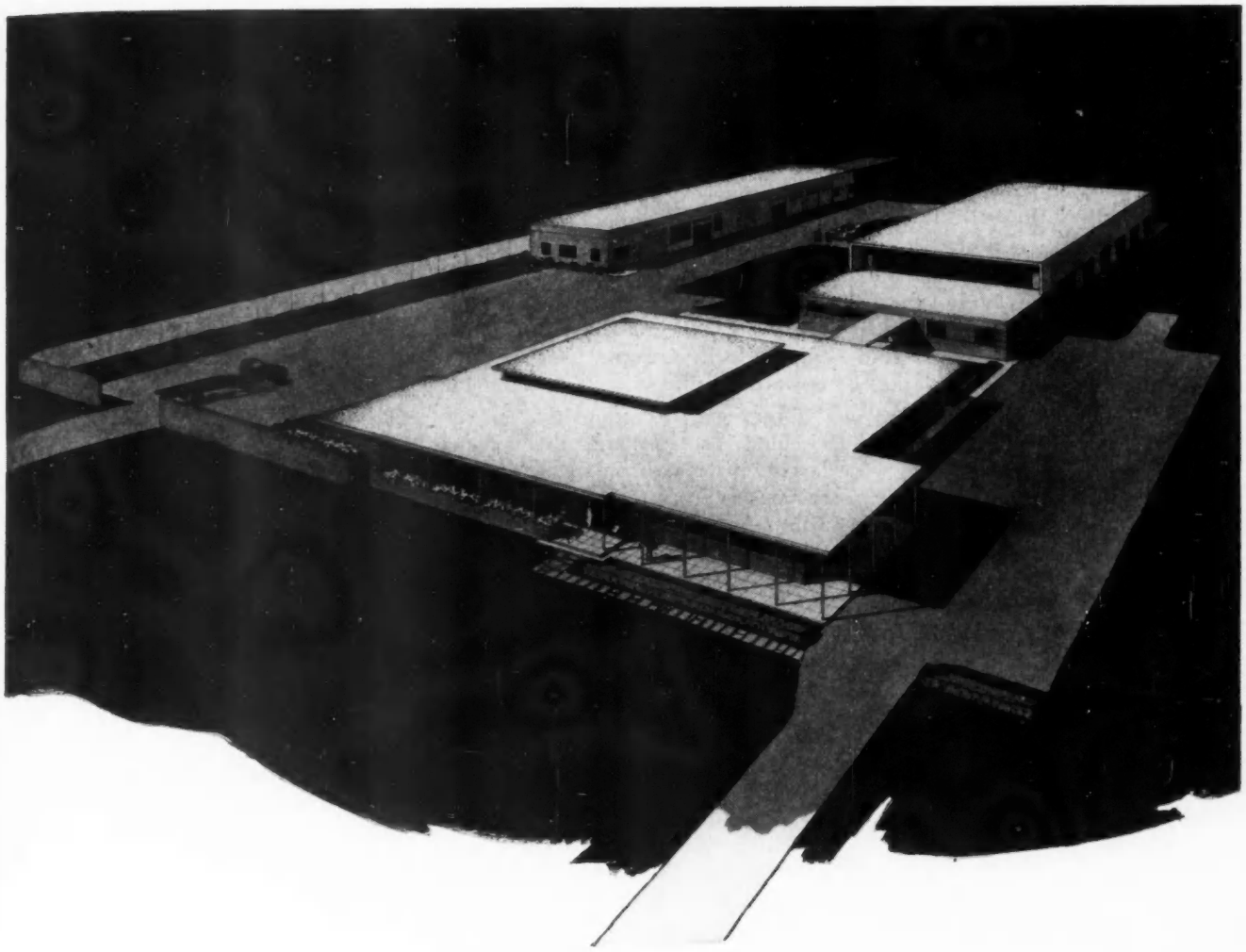
In plug flow, the fluid velocities are equal from the edge to the center of the stream and the mud moves as a mass without channeling or eddying.

With constant circulating volume, annular velocities will change as the mud is circulated through gauge and enlarged sections of the hole. Since the type of flow is related to the velocity of the mud, the mud could be expected to move up the hole in one or more of the above flow patterns.

The largest cutting that can be transported with any given mud is dependent upon the velocity and flow properties of the mud. The carrying power of a mud may be increased by changing these flowing properties and if increased, may transport the larger cuttings further up or even through enlarged sections. This is a temporary method of cleaning the hole, requiring further increase in the carrying power of the mud to transport still larger cuttings.

On the other hand these larger cuttings can be transported through enlarged sections if they are reduced to smaller sizes. This reduction in size can be accomplished in the natural 'grinding mill' that is formed in the typical drill hole by the action of the drill pipe rotating in the gauge sections of the hole located above and below cavities. The physical characteristics of the mud should therefore be adjusted by proper treatment so that cuttings will remain in motion in the enlarged sections and become exposed to the grinding action of the drill pipe. The troubles caused by debris not removed from drill holes will now be discussed as related to the three types of mud flow.

STREAMLINE FLOW. At a given viscosity and weight, a mud with high gelation rate (rapidly increasing difference between initial and ten minute Stormer gel strength) may be expected to exhibit streamline flow through low velocity (enlarged) sections of the hole. The tendency for a "fast gel" mud to channel can be observed in the mud



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pits. The greater the rate of gelation, the narrower the flow channel becomes. Inactive mud at the edges of the pit develops gel strength high enough to resist sheer and no movement takes place. The same flow characteristics could be expected in low velocity sections of the hole.

In streamline flow, cuttings become diverted to the recesses of a hole enlargement by the reduction in velocity and by the "torque effect"[7] which turns flat shaped particles toward the region of lesser velocity. Many of these cuttings are then held in portions of the cavity by the inactive high gel strength mud. Unable to move to the gauge section of the hole, these cuttings are protected from the grinding action of the drill pipe. Material that should be transported to the surface collects in amounts depending upon the size of the cavity. As described before, the hole can be cleaned to a degree by increasing the carrying power of the mud. Any improvement in the condition of the hole, however, would be temporary unless the type of flow were changed to turbulent or plug flow. Mud gelation rate has been purposely increased for temporary improvement of hole conditions. This practice is not suggested when the mud is to be used for extended periods.

Evidence that material accumulates in hole enlargements is shown by examination of cuttings circulated to the surface. Cuttings that have been tumbled and recycled in the cavaties will have eroded edges and a rounded appearance.

As long as these cavity accumulations of gelled mud, cuttings and cavings are not disturbed, the hole remains open. Serious trouble, however, can result if the action of drill pipe in compression, or a change in mud flow characteristics (reduction in viscosity or gelation rate) disturbs these large accumulations and the debris moves into the hole. The weight of concentrated accumulations of cuttings and cavings may also cause the contents of an enlarged section of hole to slide. The action of accumulation and discharge of quantities of cuttings has probably caused much stuck drill pipe.

TURBULENT FLOW. At a given viscosity and weight a mud with low initial gel strength and very slow gelation rate may be expected to approach turbulent flow through low velocity sections of the hole. The wide agitated flow pattern of turbulent flow keeps the mud active within the hole enlargements.

Cuttings too large to move through the hole enlargements because of reduced upward velocity of the mud, can descend to the bottom of the cavity where they are reduced in size by the grinding action of the drill pipe. They move through the cavity when, because of their reduced size, their 'slip' velocity becomes less than the upward annular velocity of the mud.

Occasionally, cuttings that are not circulated out through the hole enlargements remain in the gauge hole sections or settle to the bottom of the hole during periods of no circulation. These settled cuttings are annoying in that a few feet of hole may have to be 'washed to bottom' after the return trip but the accumulations do not become large and certainly do not present the hazard associated with extended use of fast gel muds unless annular mud velocities are below practical limits.

PLUG FLOW. At given viscosity and weight a mud with high initial gel strength and little or no increasing gelation with time may be expected to approach plug flow through low velocity sections of the hole. The mud moves as a mass without channeling.

Cuttings are carried through the hole enlargement if the velocity of the mud is greater than the slip velocity of the largest cutting. Cuttings too large to be transported can descend to the bottom of the cavity where they are reduced in size by the grinding action of the drill pipe.

This type of flow has the same advantage as that of turbulent flow in keeping cuttings and cavings from accumulating in hole enlargements. The high initial gel strength, however, may be a disadvantage where release of low specific gravity solids and gas is important. High initial gel strength muds may cause swabbing of formation gas, oil or water when the drill pipe is pulled from the hole. Muds exhibiting plug type flow also require more pump energy for circulating and may result in lower drilling rates in some formations.

CHANGING FLOW CHARACTERISTICS. Large amounts of shale frequently are circulated to the surface after a mud is changed from streamline to turbulent or plug flow. This can be attributed to the disturbance of shale fragments that have collected in hole enlargements. Mud flow characteristics may be changed from streamline flow for the prime purpose of cleaning the hole. Conversion to a different type of mud often results in a change in flow characteristics. In any case, debris collected in hole enlargements may 'unload' so rapidly that the material cannot be circulated to the surface fast enough to avoid sticking the drill pipe.

If this hazard is present, the hole may be cleaned safely by circulating as the drill pipe is lowered through the enlarged hole sections. If excessive amounts of shale appear at the surface circulation should be continued until the amount of shale again becomes normal. In this way, a series of enlargements may be cleaned in stages without danger of sticking the drill pipe.

Conclusions

- Flow properties of drilling mud are important in the effective removal of cuttings or cavings from the drill hole. This becomes of increasing importance in holes containing enlarged sections where operations are continued for extended periods of time.

- Drilling mud design alone, however, cannot solve all hole problems. Hole trouble may be associated with the mechanics of the drilling operation and may in many cases, be corrected by changing drilling practice. Streamline mud flow plus the manner of operating the drill pipe frequently causes trouble on deep holes. This trouble may be overcome by changing the type of mud flow and correcting the manner of operating the drill pipe.

- Early analysis and correction of any factor contributing to hole trouble will result in more economical and successful drilling operations.—**The End.**

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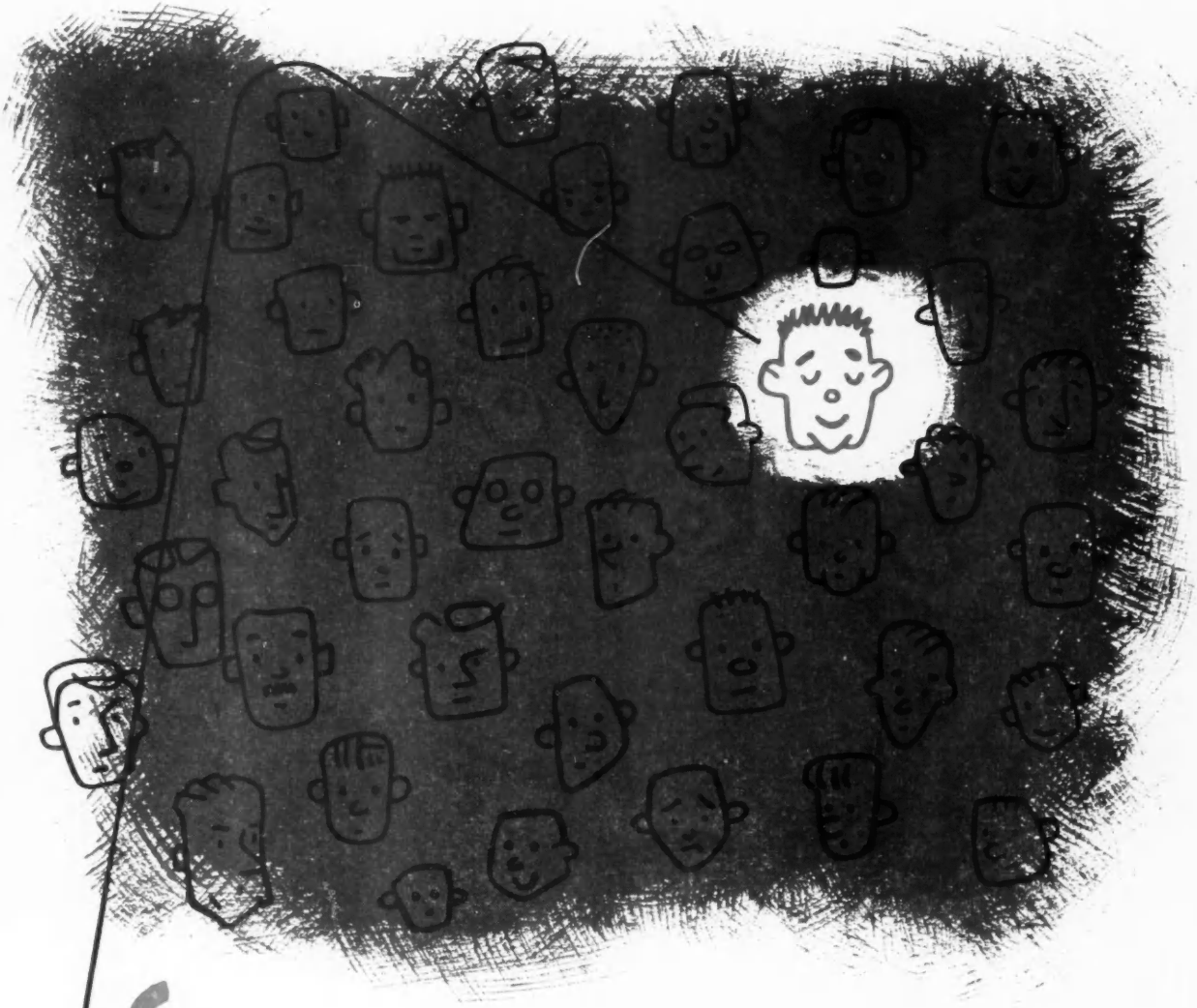

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DERRICK CLIMBING IS EASY with this counter-balance elevator designed by Derrickman Louis F. Postert. Above, Postert is going up. Right is a close-up of the designer in his harness.

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A SIMPLE one-man derrick elevator is making the work of derrickmen easier, safer and a lot more pleasant. It is being used on 17 Humble Oil & Refining Company rigs.

The device provides a counter balance which offsets most of the derrickman's weight and enables him to climb up and down the towering derrick with amazingly little effort. The elevator gadget, devised by Louis F. Postert, derrickman on Humble Rig No. 14, answers a need felt by every man who has ever "worked derricks" since rotary drilling rigs first came into use more than a half a century ago.

Today's modern drilling derricks are higher than a 12 story building. In the normal course of a day's work, the derrickman may have to go up and down the ladder several times in one day's tour.

Climbing can become tiresome work, particularly if a strong wind is blowing or if ice or water are on the ladder rungs.

The simple elevator, designed by Derrickman Postert, eliminates the fatigue and most of the hazards of the derrick climbing. The gadget has a long cable that runs through a sheave,

—Photos by Mel Coston

or pulley, attached to the derrick at the head of the ladder or in such a position around the derrick member so as not to be fouled by the hook. Safety provisions prevent the cable from coming off of the roller. At one end of the cable is a double safety belt; on the other end is a weight made of a segment of steel casing. This counterweight, suspended on two pulley wheels, glides up and down the top guy wire of the derrick.

To use the derrick, the derrickman secures double safety belts about his body, and climbs the ladder in the usual manner. As he climbs upward, the weight on the other end of the cable glides down the guy wire, counter balancing most of the man's weight. There is a slight mechanical advantage as you go up due to the angle of the wire. The higher he climbs, the lighter he becomes, because the weight of the cable as he passes through the overhead pulley is added to the counter-weight side. Thus, a 200-pound man using this gadget, would have an apparent weight of only about 90 pounds at the bottom of the ladder. His weight would decrease gradually to about 50 pounds when he climbs to the top of the ladder.

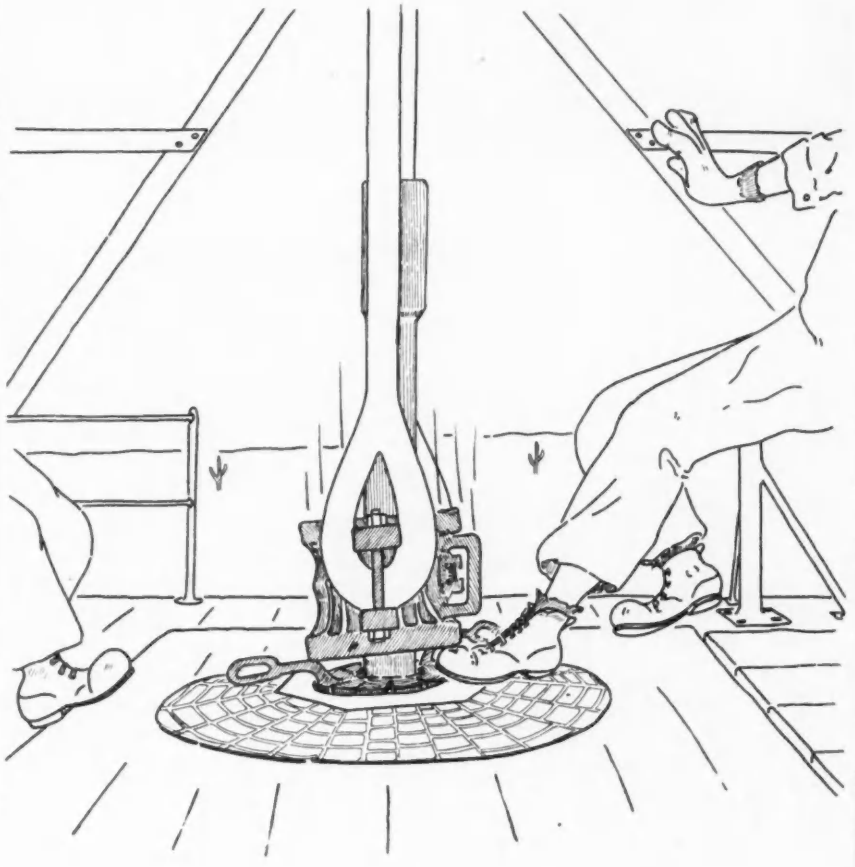
The elevator offers these advantages:

- It enables the derrickman to go up the ladder with much less effort and with much greater safety.
- Speeds up the rate of ascent and eliminates the need for a rest stop.
- The derrickman can now climb to the monkey board without fatigue, allowing him to do his work with more efficiency and greater safety.
- Double safety belts, a derrickman's safety belt and a climbing belt, protect the derrickman at all times because he is able to hook the safety belt before unlatching the climbing belt.

Drilling crews, and especially derrick men, are enthusiastic about the elevator.

ACKNOWLEDGMENT

This is a condensation of an article appearing in *The Humble Way*, March-April 1953.



It's Easy to Get Hurt!

Editor's Note: *Accidents seldom happen on unusually hazardous jobs. It is the easy, routine task that invites carelessness and causes injuries. This is one of a series of pictorial safety messages taken directly from the files of companies in the drilling industry. Clip them. Put them on your bulletin board. Drive home the warning that IT'S EASY TO GET HURT!*

The Accident: Crew was attempting to speed up the operation of coming out of the hole. Driller came down fast with the traveling block and the floormen slammed the elevators on the next string. One man slipped as he tried to jump back. Driller didn't catch the block soon enough and the elevators dropped on the foot of the floorman.

Safety Director's Report: The race against time caused carelessness. The driller had joined in the spirit of the "game," and thus the careful supervision he should have given was not there.

● ARE YOU PROUD OF AN IDEA? . . . one which makes your job easier . . . saves money . . . or time. Well, why not let others in on it and make yourself some money at the same time? Here's all you do. Just snap a picture of the timesaver. Send us the picture along with a written description. We'll do the rest. Just address your idea to, Drilling Hints Editor, WORLD OIL, Post Office Box 2608, Houston 1, Texas.

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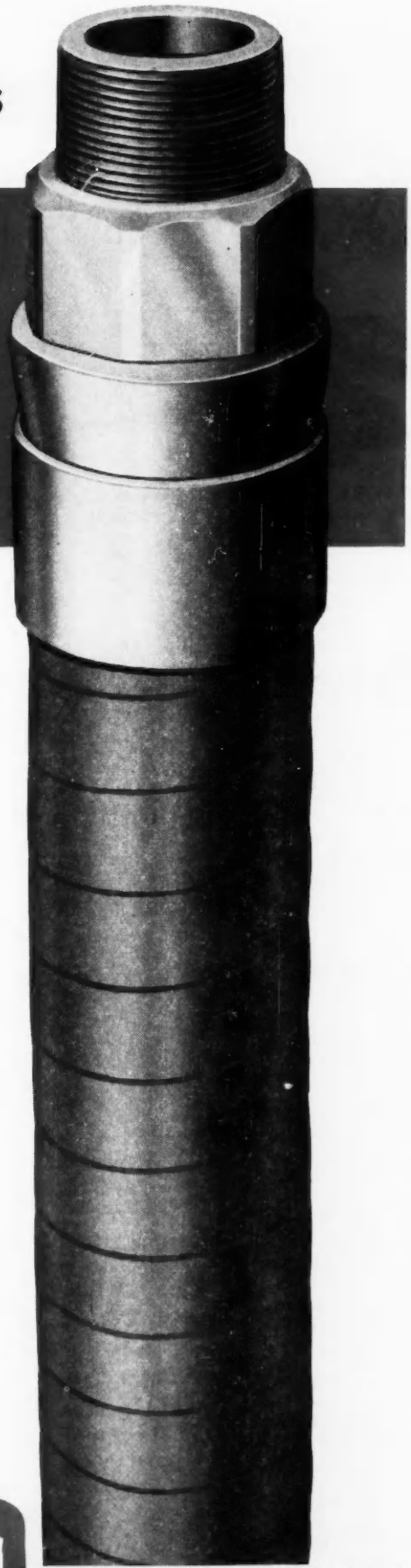

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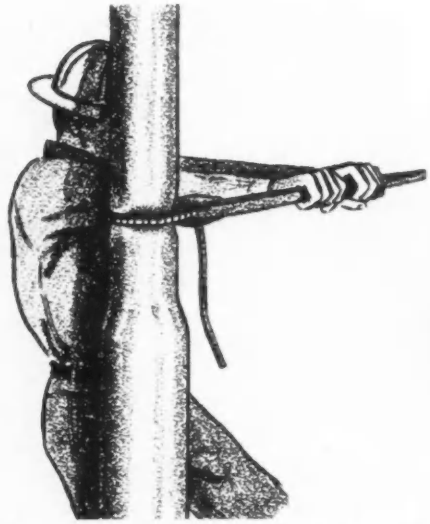
BEFORE EACH TRIP, disassemble core barrel. Check and oil all bearings.



DON'T USE TONGS on thin section. Outer casing may bend, causing inner barrel to bind.

PROPER STORAGE will prevent the parts from being damaged or lost around the rig.

Avoid Core Barrel Trouble

. . . . by following these simple rules. The results will be increased recovery and decreased costs.

By DENVER WOFFORD, Sales Engineer, Reed Roller Bit Company

NEARLY ANY MODERN core drill is capable of getting a high percentage recovery of good cores if it is in good condition.

Even the best will not get a good recovery, however, if it is damaged or dirty or improperly assembled. Frequently there will be no recovery at all and occasionally a fishing job will result from running a damaged core drill.

Since the core barrel is on the rack most of the time, many troubles arise from corrosion or mechanical damage due to handling.

Most troubles can be avoided by carefully following this program of inspection and preventive maintenance.

Before Each Trip

1. Disassemble the core barrel, check and oil the bearings. If any part of the bearing assembly is corroded, excessively worn or otherwise damaged, it should be replaced. Unless this is done the inner barrel might stick and core recovery might suffer.

2. Check inner barrel for straightness and for damage by fluid cutting.

3. Inspect outer barrel for straightness, uneven wear, and evidence of fluid cutting or washouts. Under certain circumstances a washout could allow the bit to become stuck as a result of insufficient circulation through the core bit head. A bent or crushed outer barrel could bind the inner barrel and reduce core recovery.

4. Reassemble core barrel, checking all threads to be sure they are made up solidly.

5. If the barrel is of the non-rotating inner barrel construction, see that the inner barrel is free. Turn the inner barrel at least one revolution before installing head. Watch out for evidence of binding.

6. Inspect core catcher to see that it is clean and in good condition. Check to make sure there is no mud or formation caught behind springs or toggle.

7. When installing head, be sure it makes up solidly without binding inner barrel.

8. Check to see that core catcher is free to turn.

During the coring operation, follow the suggestions of the manufacturer as to weight, rotary speed, pump circulation, etc.

Between Trips

1. Wash out inner barrel thoroughly.

2. Make up all threaded connections solidly.

YOU USE FEWER BITS WHEN YOU DRILL WITH DRISCOSE*

DRISCOSE gives you better lubrication in the hole and helps you get more footage per bit. Small amounts of **DRISCOSE** produce a dependable, stable mud with superior viscosity, gel and suspension qualities at the desired water loss. Excellent thixotropic properties, too. And **DRISCOSE** forms a thin, strong filter cake. You can cut down your over-all mud costs with **DRISCOSE** Order **DRISCOSE** today, from your regular mud dealer.

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*DRISCOSE is a trademark for Sodium Carboxymethylcellulose.

CHECK BARREL for straightness. If inner barrel has been damaged it affects recovery.

3. Check condition of core catcher.

4. Make sure inner barrel and core catcher turn freely.

After Coring

1. Clean entire core barrel thoroughly.

2. Coat all parts with rust preventive compound or light oil.

3. Reassemble core barrel.

4. On exposed threads, use thread protectors or wrap with rags and bind with wire.

5. Store core barrel on pipe rack where it is protected from mechanical damage and bending.

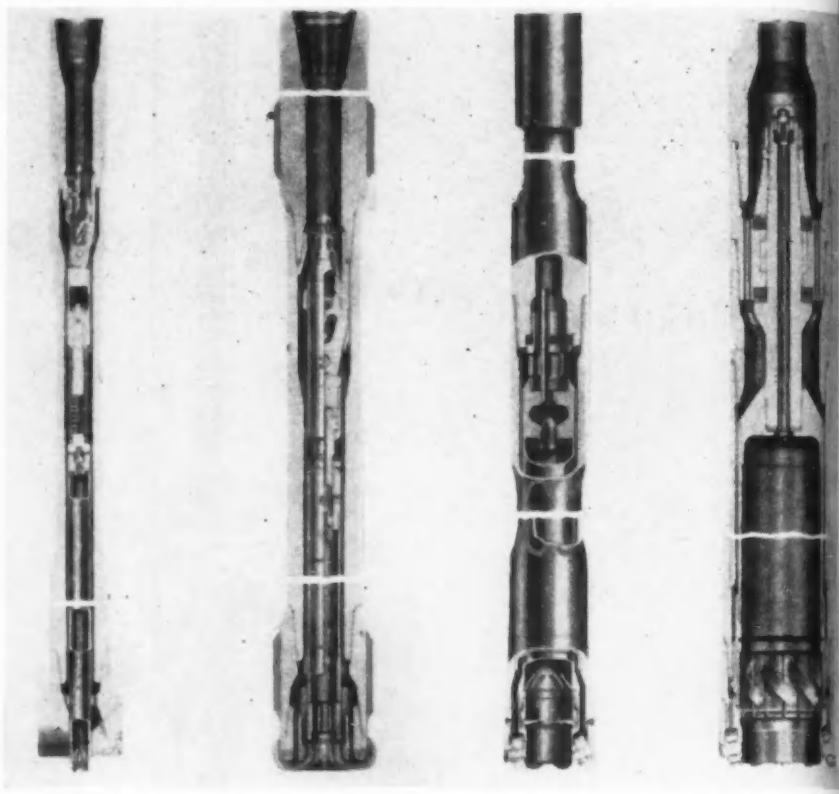
Wire Line Coring Equipment

The same general care should be exercised as with conventional coring equipment, except for the following:

1. Make doubly sure all inner barrel threads are shoulder tight. The threads may be jammed over each other by the impact when the inner barrel seats unless the shoulders can absorb the shock.

2. Pump inner barrel down at moderate rates to reduce the abuse the barrel must take from striking internal upsets in the drill strings.

3. Don't pull inner barrel out of the hole too fast. If it is pulled too fast, portions of the core might be jarred or sucked out of the barrel. If the core should lodge in the lower part of the outer barrel, it could keep the inner barrel from seating properly on the next trip and the result would be no recovery.



FOUR TYPES of core drills in common use. Left to right, conventional wire line, diamond head wire line, conventional core barrel and special frangible core barrel. While core drills vary in design, many handling precautions are applicable to all types.

4. Check sinker bar between trips to see that all joints are sufficiently tight. If two sections of the sinker bar should become unscrewed on a trip after the inner barrel, a round trip with the drill pipe would be necessary to secure the inner barrel.

5. Keep small parts in the core box provided, to keep them from getting lost or damaged. Core catchers are particularly susceptible to damage by being stepped on, and they are so small they are easily washed off the floor and lost.

General Precautions

When making up outer barrel, use tongs on heavy section next to threads. Tongs used on light sections may crush or bend the outer barrel.

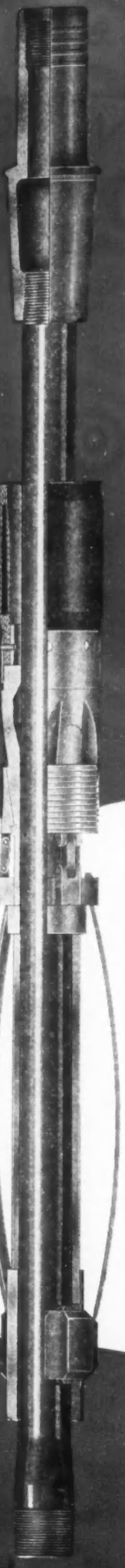
Since straightness of both inner and outer barrels is essential to correct operation, all precautions should be taken to avoid bending while handling or transporting.

A small amount of time spent by just one man on a crew can repay the operator many times in better core recovery and decreased coring costs.—**The End.**

About the Author

DENVER F. WOFFORD, sales division manager for Reed Roller Bit Company, is a veteran of over 25 years oil field and sales experience. A native of Hill County, Texas, he attended the public schools in Chickasha, Okla., and studied petroleum engineering at the University of Oklahoma.

In 1935 he joined Reed as a salesman in the Texas Gulf Coast Division. His experience with Reed includes sales assignments in Texas, Wyoming, Oklahoma, Mississippi, South America; a stint as sales engineer at large, and as division manager of the Alberta, Canada, Division before assuming his present position. During World War II Wofford took time out from the oil fields to serve 2½ years with the Army.



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How to do it

DRILLING HINTS

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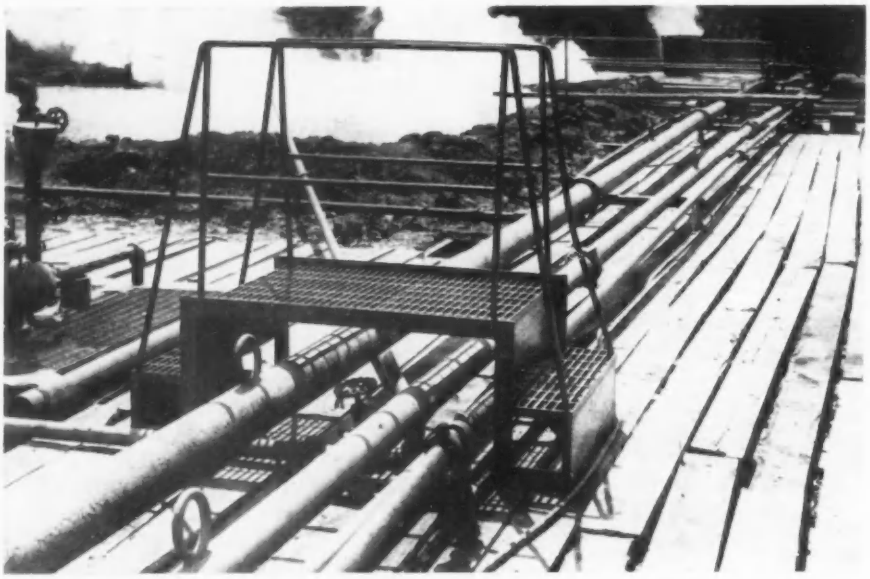


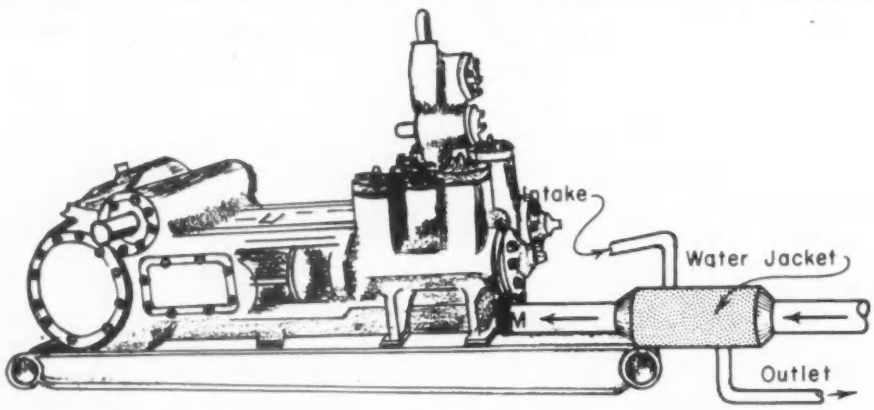
Permitting Access to Equipment

Make a pipe bridge of steel grating and eliminate the hazards of stepping over hot steam lines.

On the Gulf Coast steam rigs are still prominent and the steam lines which are strung between the rig and boiler hamper or are obstacles to normal work around the rig.

At Liberty, Texas, one company designed a compact, sturdy bridge and steps made of angle iron and steel grating which would permit easy access to equipment needing attention. Handrails of ¾-inch steel rods were welded to the base as shown. The bridge is wide enough to permit carrying of small objects across without obstruction.

Note the use of the lifting eyes or bails shown in the foreground. Weld 1-inch rings at the midpoint of each joint to help the handling of the line when installed or removed. A boom or hoisting crane with an adequate sling can easily lift or position the individual joints.



Cooling Mud Suction Cuts Pump Repairs

Make a device for cooling drilling fluid and reducing parts repairs in deep drilling by placing a water jacket on the suction end of the mud pump in areas of high temperature.

Design or purchase a water jacket for this purpose. Water intake, supplied by a water feed pump, is connected to the water jacket. The water is drained out through the outlet into the water pit. The jacket serves to cool the mud and makes it possible to control the mud easily.

A contractor did this at Vivian, La., and noted a reduction in wear on parts in the piston rod packing and valves. Other advantages of the method are that viscosity-reducing chemicals stay active longer and less wear is noted on drill pipe and bits.

Making Bucket Stand

Make a stand for pipe thread compound which can be moved about the rig in easy reach of the drilling crew.

Weld 3-inch diameter base plates on 1½-inch pipe legs of desired height. Attach legs to a base made of thin steel strips which have been shaped to the contour of the bucket and have been attached to a supporting ring 12 inches in diameter. Handles can be welded to the structure to facilitate moving. When the lubricant bucket is set into this structure, it will remain upright, eliminating hazards of contamination.

Other variations of the stand can be made. One type illustrated is the table stand. Weld a table with 6-inch steel sides and mount it at the corners with legs made of 1½-inch pipe.

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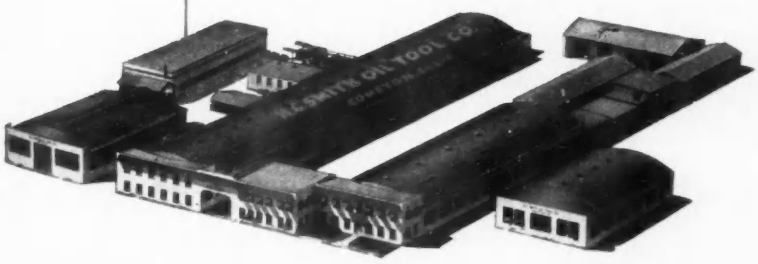
and **we have the facts to prove it!**



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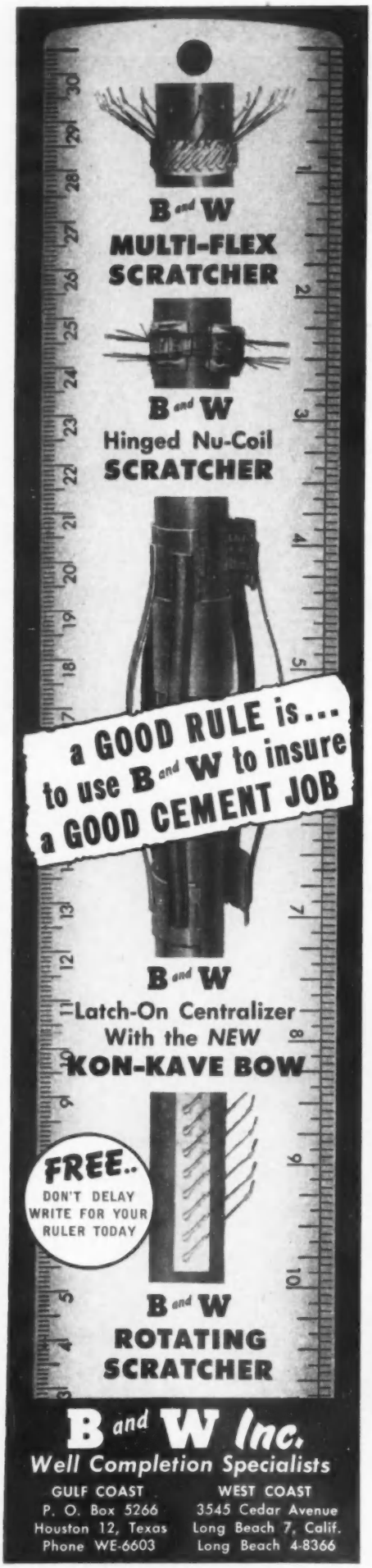


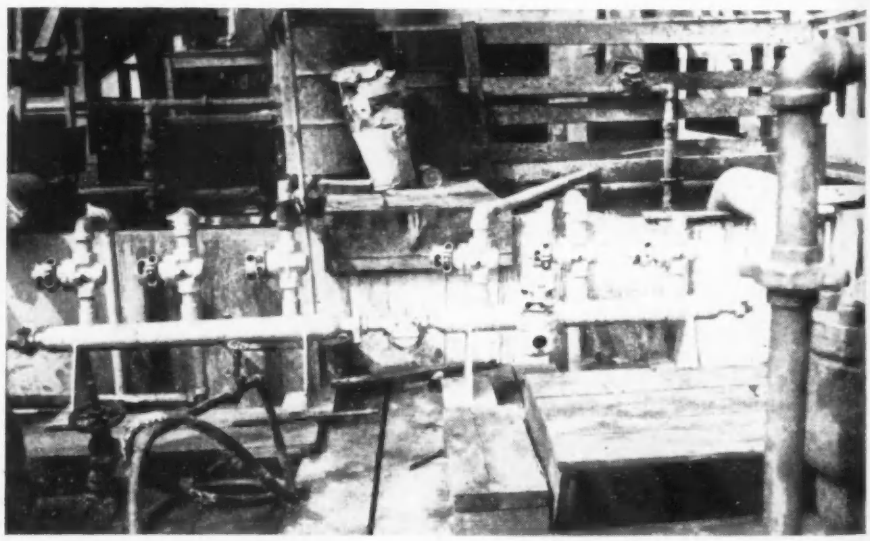
Adjusting Belt Tension With Turnbuckle

Keeping proper belt tension on mud pumps, an old problem in spotting pumps, has been solved by the use of guy wire turnbuckles welded to the front of the pump.

Mount the pump on skids in the usual manner with adjustment slots so that the pump can be moved back and forth. Center and measure turnbuckles on the skid and adjust so they run free. Cut end eyes off and bend to base using 45 degree weld. These ends are welded to the side of the pump frame and to the top of the skid.

Pumps are spotted at well locations and jacks are used to hold the pump in the approximate position until the turnbuckles are loosened enough for the belts to be slipped on the sheaves. Tighten the turnbuckles until the belts are at their proper tightness. Constant check should be made to keep proper adjustment.

Increased belt and bearing life has resulted from this simple rig and it has minimized the power drop between engines and the pumps.

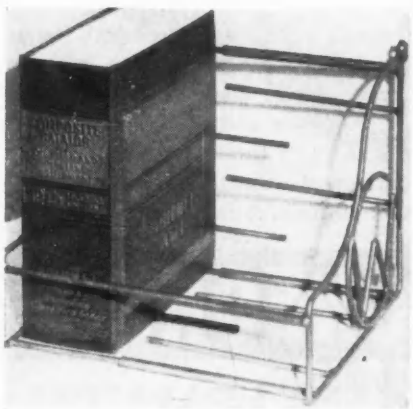


Constructing Compact Header Manifold

To save time when hooking up service lines in the mud system and to keep bulk space to a minimum when moving, a simply designed, compact header manifold has been constructed which performs all the func-

tions that a larger and more bulky manifold will perform.

This manifold was made in two identical sections, each fitted with three take-offs, and each having identical fittings on the ends so that either end will match the other when hooking up. Because of the identical ends, mud may be pumped into either side of the manifold. Each section is mounted on a piece of wide web "I" beam with flanges left on the bottom side for supports so the unit can be installed on the ground surface, or upon cribbing, if it becomes necessary to change the elevation of the manifold.

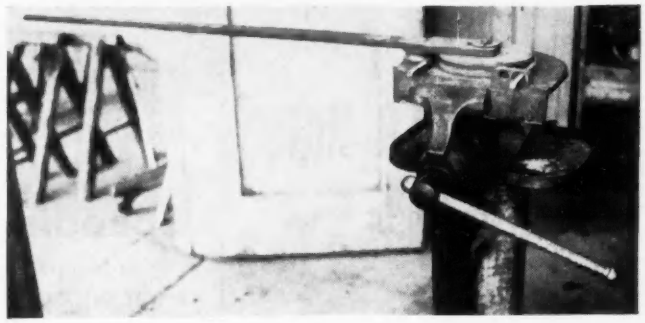


Storing Catalogs

Make a bookcase of welding rods and copper tubing to hold copies of the Composite Catalog. Weld the unit to the doghouse wall where it's handy to rig personnel. Chet Whaley, Houston contractor of Whaley's Well Service Company, has designed expandable bookcases to be placed on all his rigs.

The two portions of the bookcase are made of welding rods that slide inside of tubing, thus providing for expansion like a curtain rod. Welding rods and tubing the same size as the depth of the books to be held in the case are used. The capacity is increased or decreased by adjusting the length of the unit to hold the desired volumes.

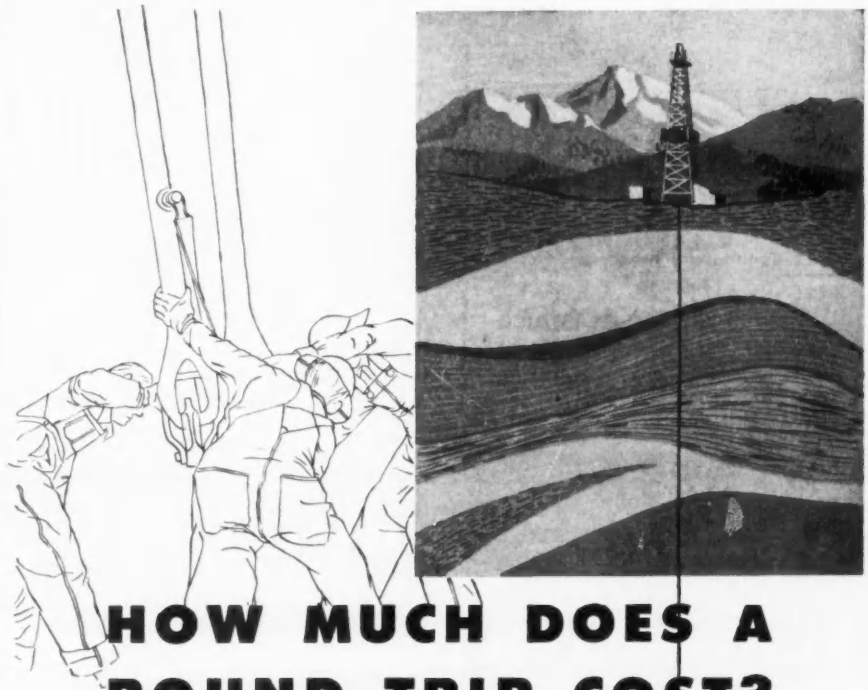
Making Clamp Bolts with One Sweep



Form pipe saddle or clamp bolts with the aid of a simple tool which is easily constructed from scrap metal.

The base is a section of heavy plate. One edge is turned at a 90-degree angle to facilitate clamping in a standard machinist vise. Two circular-grooved sheaves are provided, one for 6-inch and the other for 4-inch bolts.

On one side of the base and above



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the lip held in the vise are holes drilled through a bar welded to the base. The handle or lever rotates on a pin securing the 4- or 6-inch sheave and contains a small grooved sheave properly spaced with respect to the holes in the handle.

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Speeding Workover Jobs

Mount a pump on a war surplus truck and speed workover jobs. Hang the suction line out the back so that it is only necessary to back the truck up to the nearest salt water pit and hook the discharge line to the flow line on the well and engage the power takeoff clutch to start killing the well.

Using a war surplus truck, the mud pump is mounted on the flat bed with a chain sprocket set over the power takeoff which is normally used to run the truck winch. After fastening the pump down using the regular holes in the frame for the bolts, a three-inch nipple is welded fast to make a well for inserting the stand pipe to hold up the suction hose.

A frame is made of two-inch pipe with a brace and pulley on the outer end to carry the wire rope which supports and adjusts the height of the suction hose. A hand winch is used to

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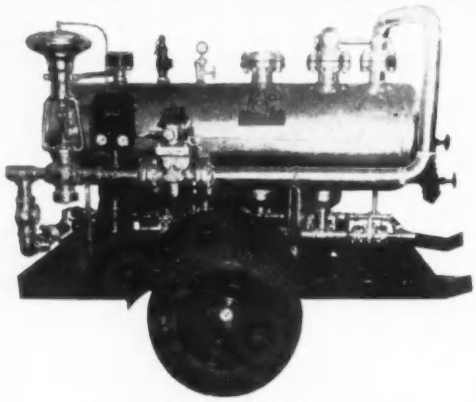

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This compact Wellchecker has facilities for metering both oil and gas. A tie-in line permits rejoining oil and gas after metering, if desired. No. 6H—2406 can also be furnished with automatic water knockout to remove and meter free water. Unit simplifies periodic well tests, gas/oil ratio tests, drill stem and potential tests. See Composite Catalog or write for illustrated Bulletin No. 1952-W.

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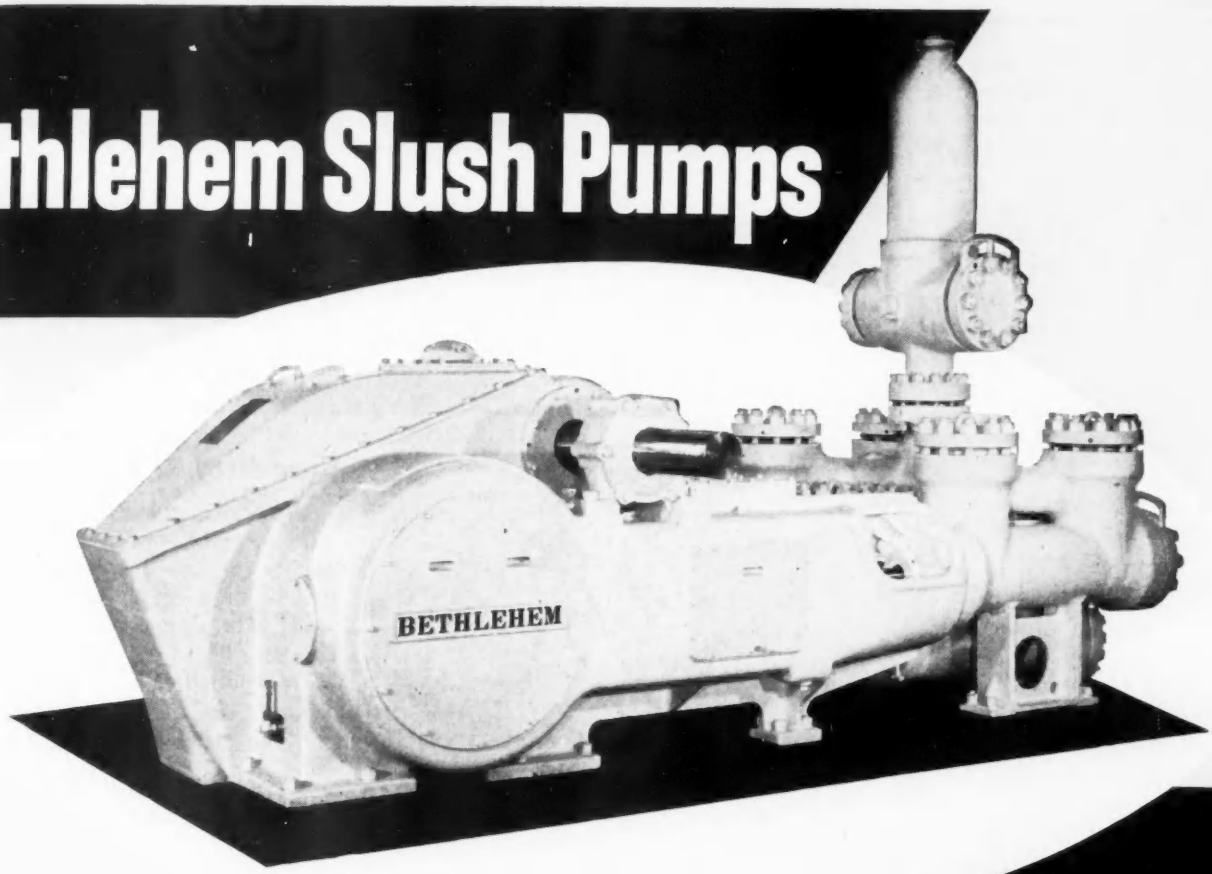
Bethlehem Slush Pumps



are built to handle volume

For depths ranging from 3500 ft to maximum, Bethlehem offers heavy-duty slush pumps in four different sizes. All are unusually powerful units, all have the "push" needed for fast, continuous circulation.

But that's only part of the story. The pumps have something else that's just as essential in present-day drilling. They are built to handle *volume.* Each of the four sizes, even the smallest, has a bore that accommodates an 8-in. liner. Since strokes are 14, 16, and 18 in., it's obvious that these pumps can move a lot of fluid.

And even a quick look will show you the sturdiness of the fluid end. It's heavy and massive, with plenty of strength in reserve, far more than the pressures call for.

Other features, all of them marks of a well-planned, well-built slush pump, include oil-bath lubrication . . . roller bearings throughout . . . A.P.I. metal ring gaskets on valve covers, suction flanges, discharge flanges, and stuffing boxes.

Ask for full details of these powerful, durable, two-fisted pumps. They will do a real job for you—now and in the years to come.

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SLUSH PUMPS

Size (Input Hp)	Bore & Stroke
225	8 in. x 14 in.
325	8 in. x 16 in.
450	8 in. x 16 in.
600	8 in. x 18 in.

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wind in the cable to adjust the suction hose. The hose itself is attached to a section of six-inch pipe with a mitre weld to allow the truck to be spotted some distance from the edge of the salt water. During moving operations, the hose is disconnected and laid on the bed of the truck and the stand pipe removed from the three-inch well and laid down beside the pump.

When rigging up, the pumping unit is spotted beside the nearest pit and the above procedures reversed.

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"Rumba" Shale Shakers excel in performance and low cost maintenance. They come to you completely unitized on 10 ft. skids . . . no rigging up costs in the field. The underslung screen cloth, with no obstructions on the bottom removes sand by a new method of flotation which reduces wear on pumps. This design contributes to the longer screen cloth life . . . one of the features that is causing the worldwide demand for "Rumba" Shakers.

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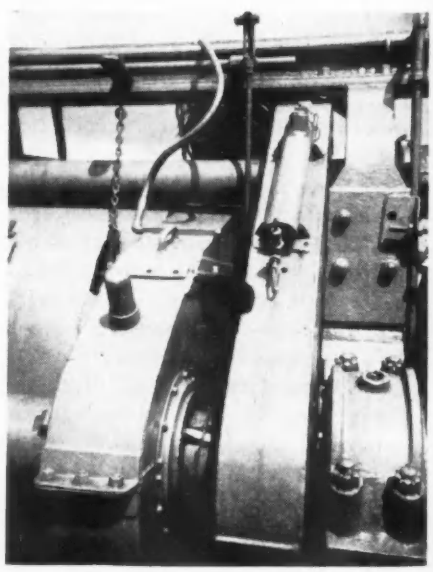
Sledding Over Mud

Use a sled made of boiler plate to slide the rear wheels of a trailer in muddy terrain. This does away with the building of an expensive board road. Mizell Construction Company, Ganado, Texas, did this in the Damon Mound Field, Fort Bend County, Texas.

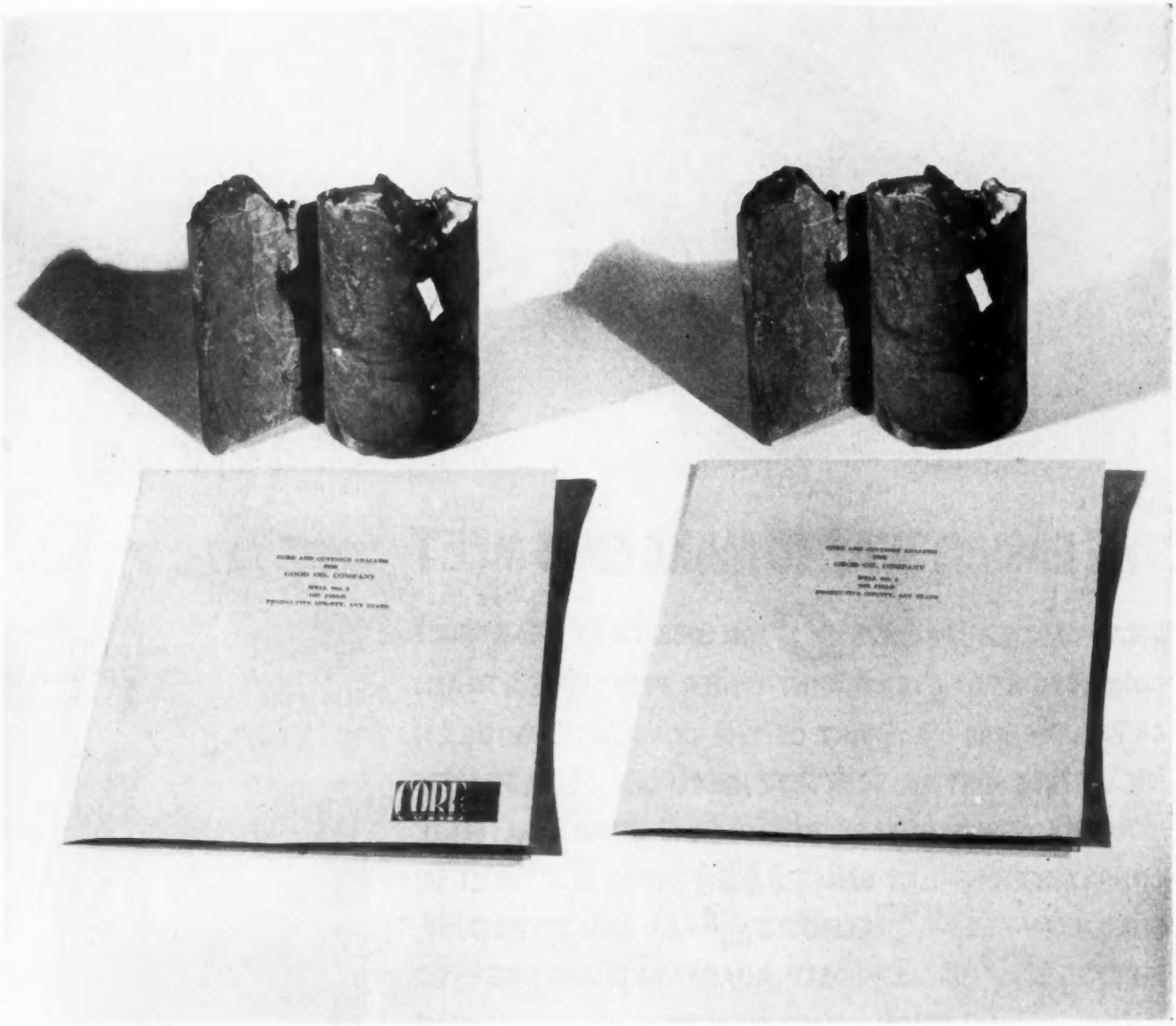
Moving rigs in this area is usually done in dry weather. But a sudden downpour means trouble. Trucks bog down and have to be pulled by cats. A trailer with eight wheels in back and front wheel tracks was pressed into service. The front rode well on tracks. But the rear wheels bogged down.

The skid was made from ½-inch boiler plate and 3-inch pile. It made an effective sled for the rear wheels on muddy ground.



Lubricating Chains

One contractor uses a piece of three-inch pipe for a chain lubricant reservoir. The reservoir is filled each tour.



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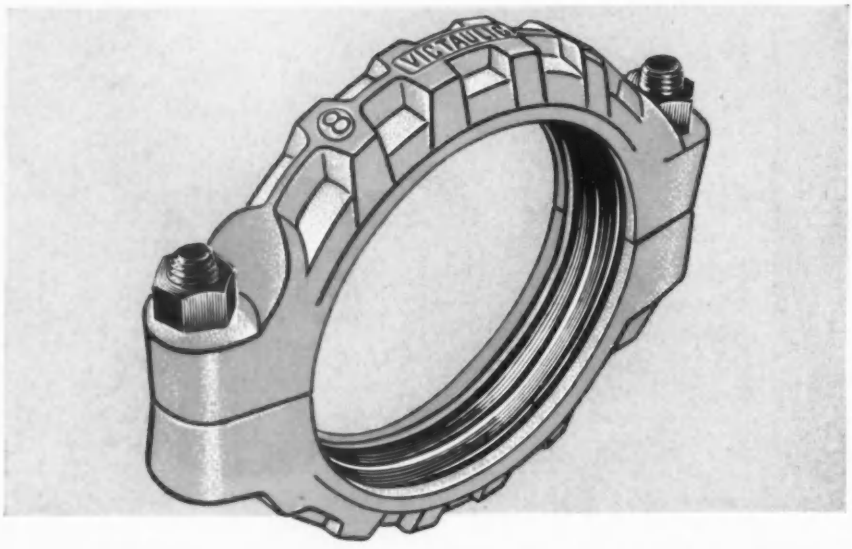

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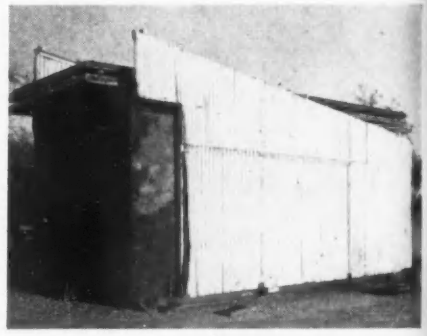
HINTS . . .

A needle valve screwed into a nipple welded to the bottom of the vessel, is used to adjust the rate of flow so that the reservoir will be emptied during an eight-hour tour. A piece of quarter-inch copper tubing is run through a hole in the chain housing and extends down to an inch above the chain. The copper tubing is connected to the outlet of the needle valve and conducts the lubricant directly to the chain.

The section of three-inch pipe is welded shut at the top end, but a two-inch collar is welded to the top of the side for a filler connection. A short piece of light chain is welded to the filler plug and the other end to the pipe to prevent loss of the plug when it is out of its connection.

The pipe is fastened to the top of the chain guard housing by means of two pieces of boiler plate which are bent into a right angle with one side saddled to fit the pipe. The plates are welded fast, one side to the pipe, the other direct to the chain housing. The valve is adjusted to control proper flow.

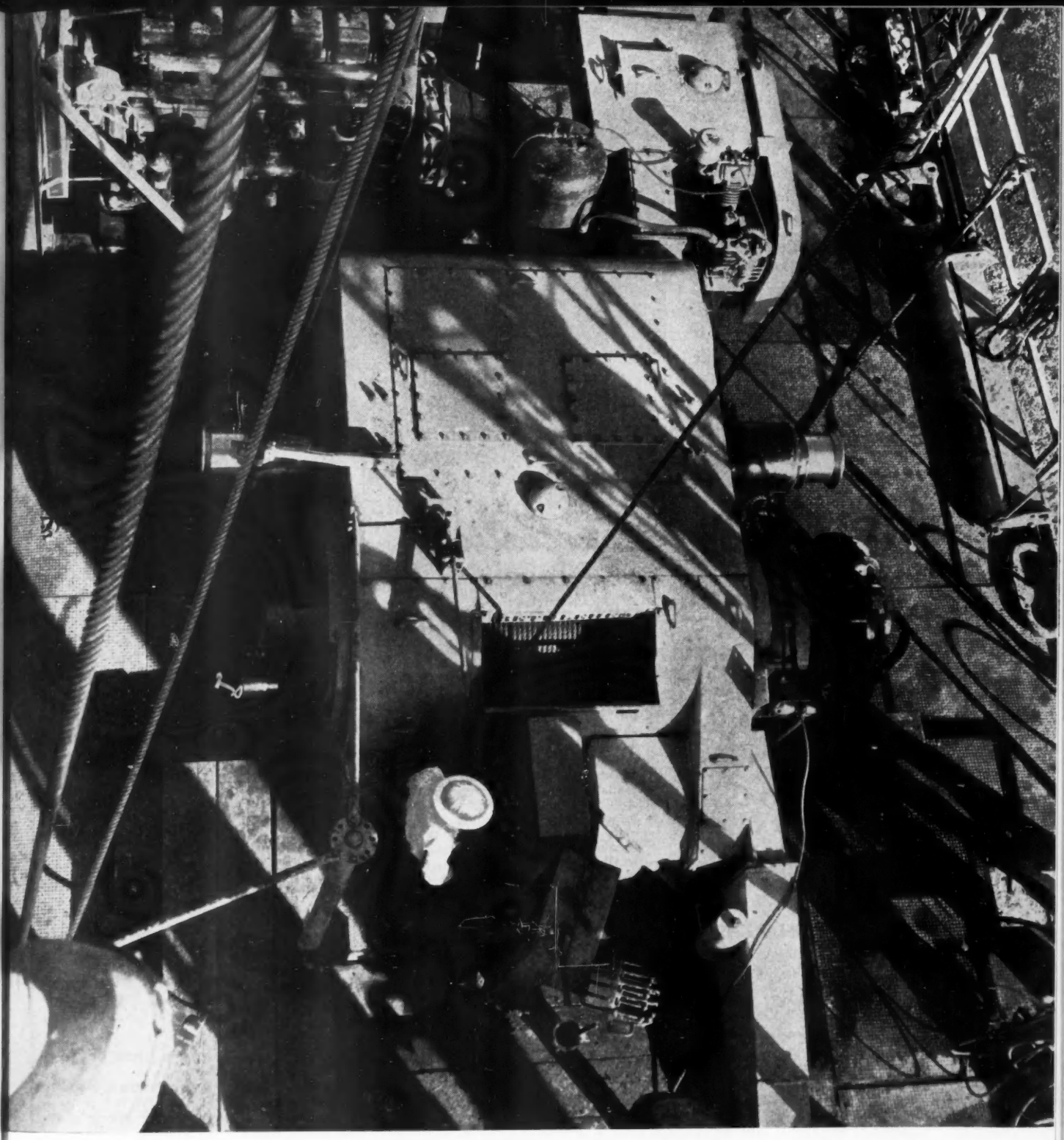


Collapsing Rig Floor

Design the rig floor and walls with complete unitization in mind, and hinge them so that they will fold in a packaged unit. That's the aim of one company which has skid-mounted the rig floor and catwalks, and has hinged the walls directly to the substructure.

Affix the catwalks to the rig floor by welding or bolting hinges on either side. Then, hinge the walls to the outer extremity of the catwalks so they may be raised when the floor is spotted on location. The walls for the front and the back of the derrick fold neatly on the floor. They can be unfolded on either end of the hinged walls and bolted to the sides of the rig.

Blowout preventers are mounted and carried in the substructure ready for immediate use.



Wire Rope at Work—Oil, like gold, is where you find it, and finding it isn't the simplest thing in the world. But the modern rig, often equipped to drill a hole several miles deep, makes oil deposits far less elusive than they once were.

Aiding the search for oil is Bethlehem rotary line, as strong and tough a rope as ever lifted a column of pipe. For the outfit pictured here, the ideal rotary line would be 6 x 21 Seale 1⅛-in. Bethlehem Purple Strand Form-Set (preformed), IWRC. Whatever the requirements, there is a type and size of Bethlehem rope that you can rely on to do a sound job in any kind of oil-country service.

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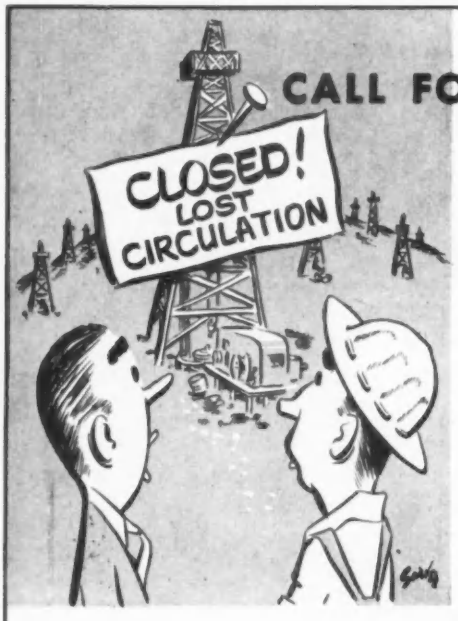
Transporting Pipe

Lease trailers with telescoping bolsters are being used on locations to transport short or long lengths of drill pipe and tubing. This eliminates a major problem of transport because of insufficient room on the back of the truck for the pipe bolster to support the front end of the pipe joints when carrying men and tools. One company has fabricated a trailer with an expanding set of bolsters to support joints of pipe through their entire length.

Weld the two main bolsters to the trailer frame. Weld four-inch pipe to each side perpendicular to the bolsters and parallel to the tongue. The front bolster is then welded to three-inch pipe runners which slide back inside the four-inch beneath the main bolsters. When the trailer is being moved empty, the front bolster slides back against the middle bolster and the tongue of the trailer telescopes to make as short a load as possible.

When a load of pipe is to be moved, slide the front bolster out approximately 15 feet and extend the tongue of the trailer a like amount to make a cradle for the pipe to be moved. If other long sections of material are to be moved, they will fit equally to this rig.



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Lifting costs can be lowered through proper . . .

Interpretation of Dynamometer Cards

By J. H. Russell, Jr. Gulf Oil Corporation, Houston

CORRECT DIAGNOSIS of trouble in a pumping well can result in a big saving in labor and materials in remedial work, which ultimately adds up to a reduction in lifting costs. This is but one factor in computing lifting costs, yet it is of major importance in view of the present total expenditures for well repairs and loss of production caused by inefficient pumping operations. The dynamometer can be an effective aid in the evaluation of pumping well troubles prior to change out of mechanical equipment after a well ceases to produce normally. Proper interpretation of dynamometer card data is essential to the success of any well study of this nature. If understood, the task is not a difficult one and can be performed easily and quickly by field personnel who are properly equipped.

The dynamometer is a recognized tool for the measurement of polish rod load, peak load, peak torque and horsepower requirements in conjunction with the design and selection of a pumping unit. In this respect, new installations would be patterned after a similar installation in which various factors affecting load, torque and horsepower were essentially the same. Use of the dynamometer for this purpose is apparent; however, in recent years the dynamometer has become increasingly important also as a control and trouble-shooting instrument.

TROUBLE SHOOTING. In using the dynamometer as a trouble-shooting instrument, it must be understood by anyone making the test and interpreting the card that the phases a pumping rod string and mechanical equipment go through in one pumping cycle will never be exactly duplicated by any other cycle for a given installation. However, 3 to 4 cards made at 15 to 20-minute intervals usually will be very similar and can be considered as a representative card for that well. Periodic tests, when compared with the past representative card, will indicate any change in pumping conditions for that particular well during the interval between checks.

A complete pumping well analysis made with the dynamometer is more involved and time consuming than those discussed here. The more detailed study is of a research nature. Interest here is upon the operational aspects of dynamometer card studies from the initial installation of pumping equipment to the day-to-day maintenance of such wells. Objective in operational use is a maximum production per investment and repair dollar.

FIELD PROBLEMS. The bulk of present pumping well installations are of standard design, and most of these have been in operation for many years. Problem in the field is to determine the trouble or reason a pumping well is not producing its expected volume of fluid before attempting any form of maintenance or repair. Lifting costs have risen steadily, due primarily to a gradual increase in material and labor costs. Since field personnel have little control over prices, they must study closely the pumping wells under their jurisdiction to assure maximum utilization of the pumping system throughout its useful life. This means that operating personnel must be able to detect the source of any inefficiencies in the pumping system so that these may be corrected at minimum expense. Proper use and interpretation of dynamometers will not only assure correct installation of new pumping units, but will simplify finding sources of trouble in older units.

BASIC CYCLE. Detecting major trouble in rod-pumped wells is not difficult once the basic pumping cycle as represented on the dynamometer card is fully understood. Figure 1 is a dynamometer card illustrating a typical pumping cycle. This is one complete cycle of the polish rod. If the pumping speed is 10 strokes per minute, this one cycle will be completed in 1/10th of a minute, or six seconds.

The vertical scale on the diagram represents the load on the polish rod, and in this illustration is 6950 pounds per inch. The horizontal scale is affected by the length of the stroke and is called the deflection.

As the polish rod moves upward and picks up the well load, the pen is deflected upward and moves to the right. On the downstroke, the load is released and the pen moves downward and to the left. The cycle may be further explained by starting at the point marked "polish rod down." Here, the polish rod has reached the bottom of its stroke and starts upward. As it begins to travel up, the traveling valve in the pump plunger closes and there is a period during which the rods stretch and the load is momentarily lessened. The rods then pick up the load and reaches its maximum load at the top of the curve marked "max. load." Past this point, the polish rod decelerates and the momentum of the load results in a decrease in polish rod load.

The point at the far right of the chart marked "polish rod up" represents that period in the pumping cycle when the polish rod is at the top of its stroke. As the rods descend, there is a short period during which time the standing valve takes over the load of fluid in the tubing. As the rods are lowered further, the load on the polish rod decreases. This load reaches a minimum at a point on the bottom of the curve marked "min. load." When the polish rod slows down, momentum causes a temporary increase in the polish rod load. The cycle is completed when the polish rod has reached the bottom of its travel represented at the point labeled "polish rod down."

→

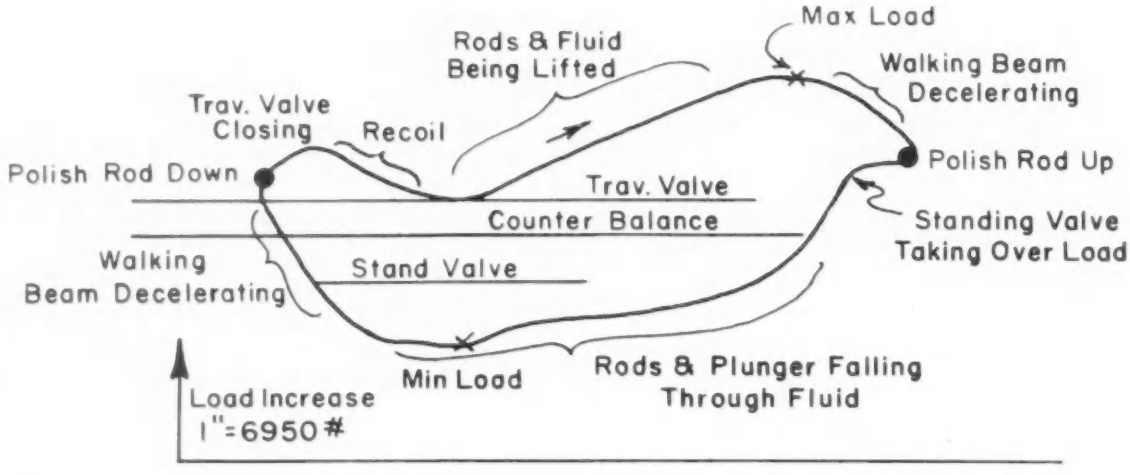

FIGURE 1

Figure 1—Typical pumping cycle as represented on a dynamometer card. Various phases of polish rod travel and operation of the mechanical subsurface pump are readily identified.

TYPICAL PROBLEMS. As a practical aid in detecting pumping well troubles, Figures 2 through 6 are of typical dynamometer cards that indicate:

- Fluid pounding.
- Sticking plunger.
- Undertravel and overtravel.
- Leaking traveling valve.
- Leaking standing valve.

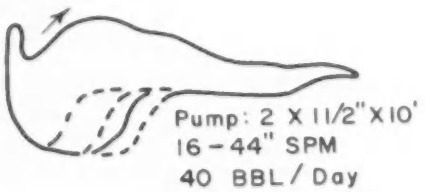

FIGURE 2

Figure 2—This dynamometer card indicates a fluid pounding condition. The plunger on the downstroke shows a sharp decrease in load at different positions on each stroke, and the well is intermittently pumping. By shutting down the pumping unit for a short period and starting it up again, the card will be representative of a normal pumper. Correction for this condition would be to reduce either the length of the pumping stroke, bore size of the rod pump, or possibly both. This change or changes will result in a withdrawal rate equal to the feed in rate from the formation to the well bore, consequently, fluid pounding will be eliminated.

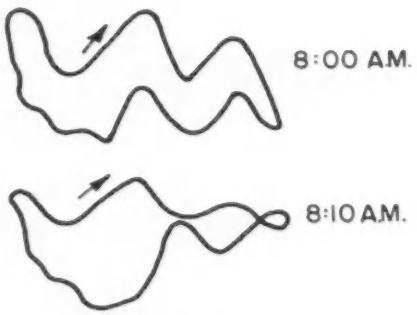

FIGURE 3

Figure 3—These cards were taken on a well in which the plunger is partially sticking due to sand in the fluid. They were taken just ten minutes apart and show that this condition would never retrace on a dynamometer card. At shallow depths, it can be detected by feeling the polish rod and noting the jerky motion of the rod string.

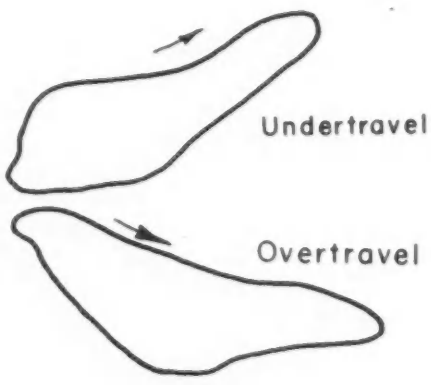

FIGURE 4

Figure 4—Undertravel of the pump plunger due to excessive loading of rods and pump is indicated by a diagram that tilts upward to the right. There is a steady load increase with no break back, denoting little travel of the pump plunger. Overtravel of the plunger is indicated by a diagram that tilts downward to the right. This condition is usually found in wells that pump at rates faster than 20 strokes per minute.

About the Author

JOE H. RUSSELL, JR. is an area petroleum engineer in Gulf Oil Corporation's Gulf Coast Division. His headquarters is in the Pierce Junction field near Houston. He studied petroleum engineering at the University of Texas from 1940 until 1942 when he joined the air corps of the U. S. Navy where he became a pilot. Upon his discharge in 1946 with the rank of ensign, he worked for Production Service Company as a roughneck until March, 1947, when he joined Gulf Oil as a roustabout at Pierce Junction. Since then he has been a well tester in the Fannett and Thompson fields of Texas, and was a production engineer in both Thompson and Pierce Junction fields. He was made an area engineer in October, 1951.

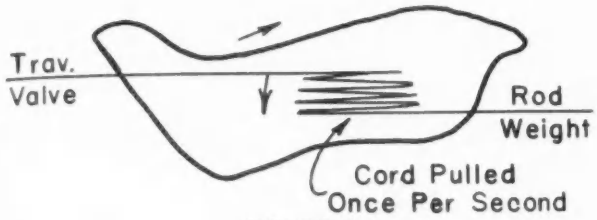

FIGURE 5

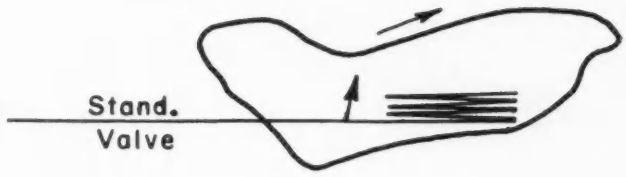

FIGURE 6

Figure 5—To check for a leaking traveling valve, the rods are stopped above the center of the upstroke and the stroke card quickly pulled about once per second. The recorded line represents the weight of the rods plus the weight of the fluid on the plunger. Time required for this line to reach the dead weight of the rods will indicate how fast fluid is leaking by the traveling valve or by the plunger. In this manner, the actual working condition of the traveling valve and plunger can be determined.

Figure 6—To check for a leaking standing valve, the rods are stopped near the end of the downstroke while the traveling valve is open and the standing valve is closed. The stroke cord is quickly pulled and the recorded line represents the dead weight of the rods in fluid. If the standing valve is operating satisfactorily, the recorded line will remain stationary. However, if it is leaking, the load will increase as the fluid is transferred to the rod string.

In checking for a tubing leak, the same procedure is followed. If the standing valve is found to be holding, then a bleeder valve should be opened to determine if fluid is falling in the tubing. Time is the major factor in differentiating between standing valve and tubing leakage. A standing valve leak is apparent in a minute, whereas, a tubing leak is generally not fast enough to record a noticeable load change on the dynamometer in the same length of time.

The following cards are tracings of actual examples of "before and after" situations encountered in the Pierce Junction field of Harris County, Texas. These cards have been screened so that only information needed to explain each condition is shown.

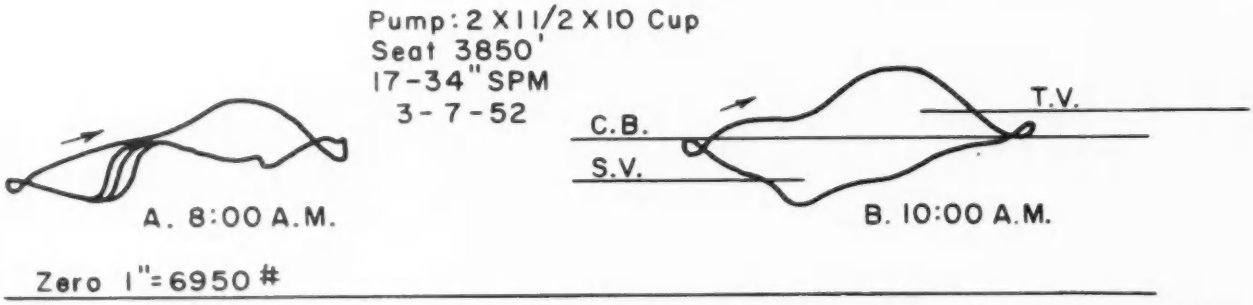

FIGURE 7

Figure 7—This well was reported off by the pumper on March 7, 1952. Card "A" was taken at 8 a.m. and indicates the well to be pounding fluid. Note the various positions of the plunger as it hits fluid on the down stroke. The well was shut in for two hours and card "B" taken. This is a normal card for this well. This procedure showed that a pulling job would be wasted time and money. As a remedy, a time clock was installed and set so that the well pumped six hours and shut down for six hours. Production increased five barrels daily.

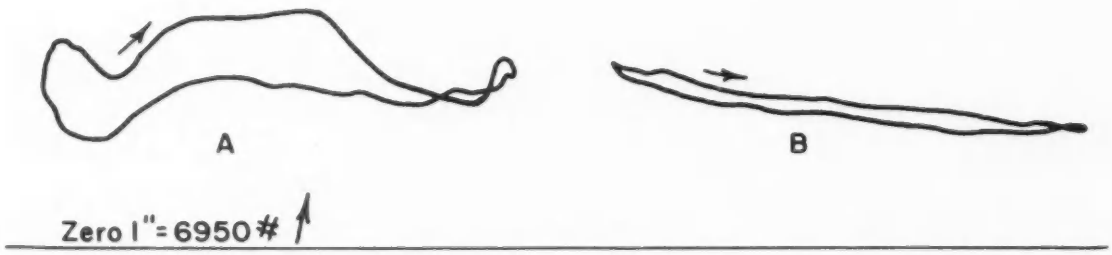

FIGURE 8

Figure 8—Here is a case of an unseated pump. A new pump was installed in the well on August 17, 1951, and on the morning of August 18, 1951, the well was reported not pumping fluid. Card "B" was taken and indicated that there was no fluid load on the plunger, therefore, the pump was doing no work. The pump was reseated and card "A" taken. This card indicates a normal pumping cycle for the well and shows that the correct remedial action was taken. The dynamometer in this case probably eliminated an unnecessary pulling job by quickly learning the actual trouble.

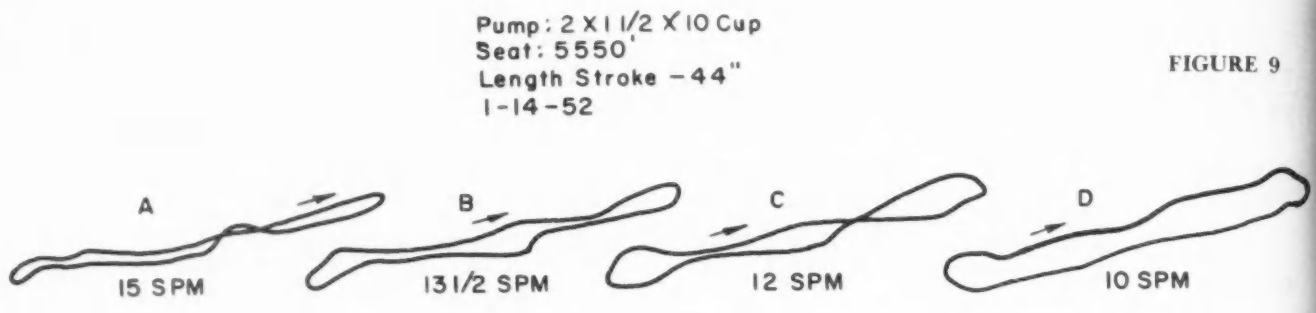

FIGURE 9

Figure 9—Dynamometers can be used effectively in selecting the optimum pumping speed. Where gas engines are used, cards can be taken at various pumping speeds and the most advantageous speed quickly determined. By examining the above cards taken at different speeds, it can be seen readily that card "D" indicates the speed at which maximum work is being done by the pump. All these cards indicate plunger undertravel. This is due to a 1½-inch bore pump set at 5550 feet with a short stroke and fast speed. When this well is pulled, a 1¼-inch bore pump will be installed and subsequent cards will appear more "level."

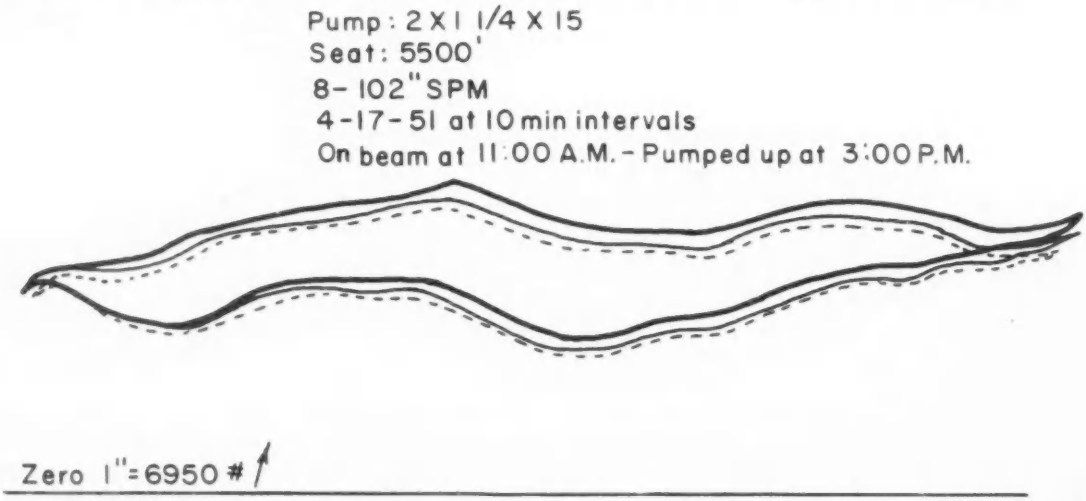

FIGURE 10

Figure 10—Dynamometers have been used on many wells immediately after installation of a new pump to determine if the well is pumping up. This is helpful on low fluid wells which would normally take from two to four hours to pump up.

An increase in polish rod load can be detected on successive cards taken at ten minute intervals. If all cards appear to be in order the rig can be released early with assurance that the well will pump up properly.

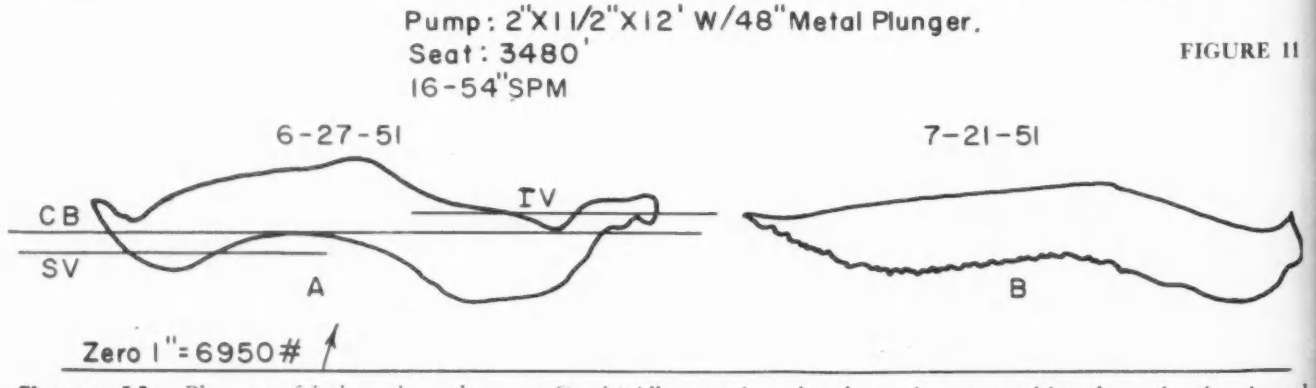

FIGURE 11

Figure 11—Plunger friction is clearly detected by dynamometer tests. A 2 x 1½ inch by 12-foot rod pump with a 48-inch metal plunger was run in this well on June 27, 1951, with the expectation of longer life than one similarly equipped with cup plungers. Card "A" was taken shortly after the well was put on the pump at the rate of 163 barrels daily. Card "B" was taken July 21, 1951, when tests showed this well to pump only 80 barrels per day. The last card indicated that the plunger was not running smoothly through the barrel. Note the "chatter" on the down stroke, and indicated loss of efficiency. The pump was pulled and on inspection, plunger was found to be badly grooved lengthwise, substantiating the dynamometer diagnosis.

AXELSON BOTTOM-LOCK MECHANICAL HOLD-DOWN REDUCES DOWN TIME

The Axelson patented renewable seat shoe has been developed to prevent the possibility of leaking or sticking due to corrosion. The seat and locking spacer are made of stainless steel, hardened and ground, and each is reversible. Upper end of the shoe assembly has a clamping collar, either upset or non-upset, for attaching to the tubing. The lower end has an external tubing thread, also upset or non-upset, with an inner thread of smaller diameter to receive the anchor pipe. This is another efficient device designed by Axelson to help operators reduce down time and increase barrels per day.

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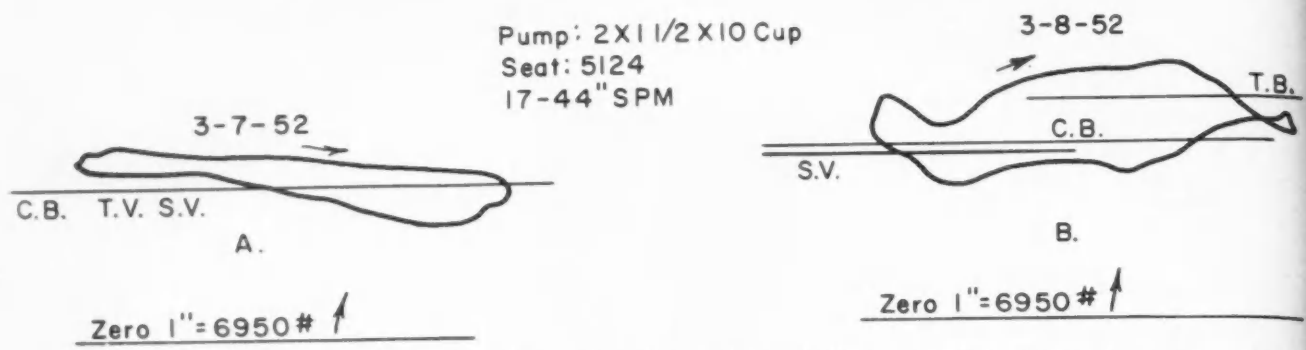


FIGURE 12

Figure 12—Worn pumps are indicated on dynamometer cards. This well had been acidized and swabbed. All the acid was not recovered due to low fluid level. The well was placed on the pump and rate of production declined rapidly from 110 barrels to 40 barrels daily over a two weeks' period. Card "A" was taken at the 40-barrel rate and card "B" at the 110-barrel rate. Card "A" shows that the traveling valve and standing valve are the same, indicating badly worn cups on the plunger which would not support the load. The pump was pulled and inspected, showing the dynamometer to be correct.

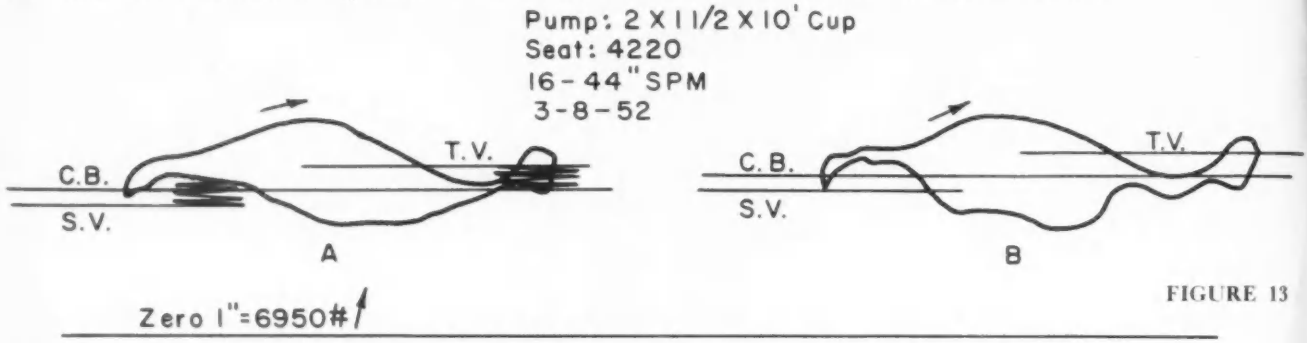


FIGURE 13

Figure 13—Leaking standing and traveling valves are detected. Production from this well was two-thirds below normal. It was suspected that there was a hole in the tubing. A dynamometer card was taken as the pulling unit was moved in. Normal pump action was picked up by the dynamometer, but both traveling and standing valves showed leakage. No time was wasted in testing the tubing. The pump was pulled and replaced. When placed in operation again, the well pumped its normal volume in a minimum time.

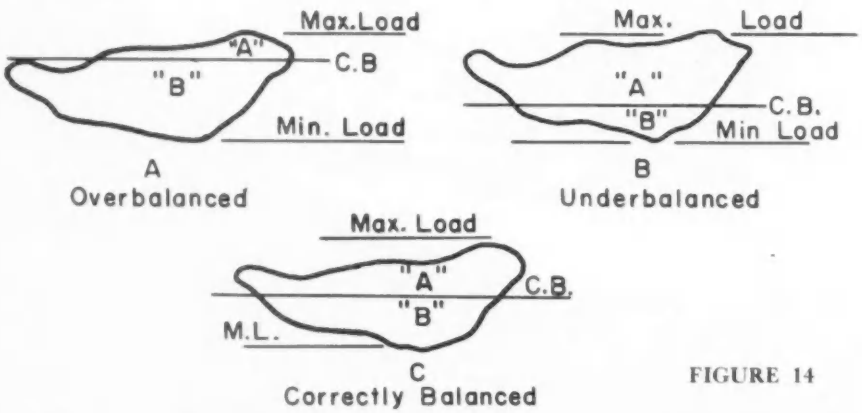


FIGURE 14

Figure 14—Pumping wells can be counterbalanced accurately with the aid of dynamometers. When a well is properly counterbalanced, the measured counterbalance effect line should be half way between maximum load and minimum load.

To check counterbalance, stop the pumping unit crank when it is at a horizontal position on the up stroke. If the well is overbalanced, the rods will go up and will have to be chained to the horse head of the unit. With excess strain taken up by the chain, the brake is then released and the load recorded. The actual value of the counterbalance effect is thus obtained. If the well is rod heavy (underbalanced), a clamp is placed on the polish rod so that excess weight is taken up by the stuffing box before the load is recorded. Card "A" is from a well that was overbalanced; card "B" from an underbalanced well.

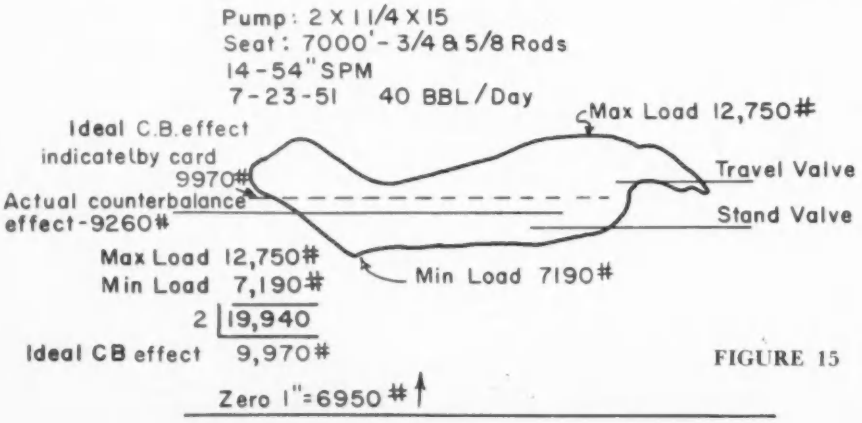


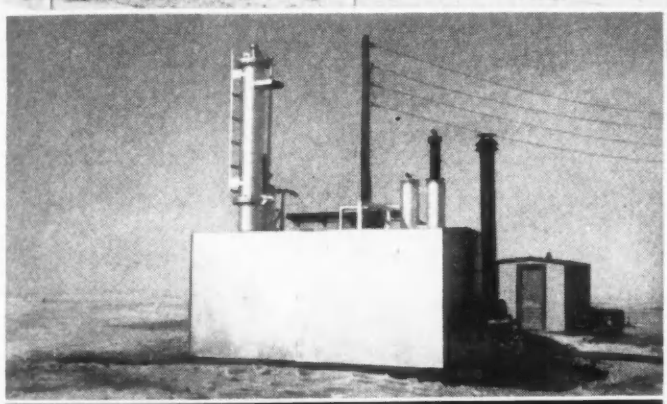
FIGURE 15

Figure 15—Over or under counterbalancing can be determined quickly

■ Continued on page 188

NATIONAL GLYCOL DEHYDRATION AND LOW TEMPERATURE EXTRACTION (LTX®)

Equipment



National 500 mcf/day, 125 # WP Glycol Dehydrator — N. Dakota

National 17 mmcf/day, 1000 # WP Glycol Dehydrator — Kansas

A 30" x 12½', 1200 psi LTX with Glycol Injection and a 24" x 15', 300 psi Stabilizing Desorber for 10,000 mcf per day operating on lease in South Texas.

This producer is realizing

MAXIMUM DOLLAR RECOVERY FROM HIS RESERVOIR

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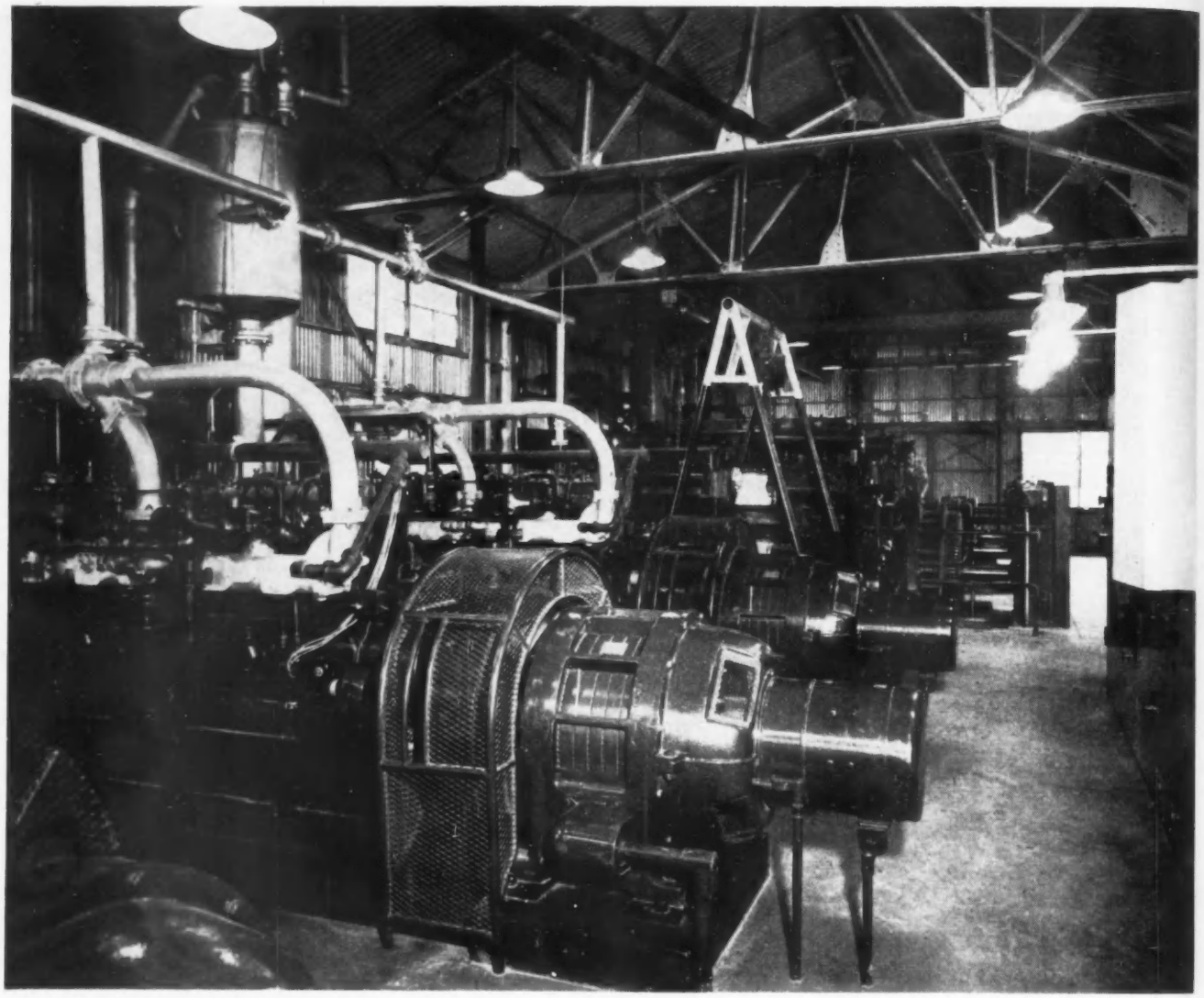

ELECTRIC GENERATOR PLANT in Wyoming. These engines are equipped with vapor phase cooling systems. Steam separator at upper left is mounted above engines.

Vapor Phase Cooling Boosts Engine Efficiency

...by (1) reducing cylinder wear (2) increasing lubricating oil life (3) improving combustion and (4) minimizing rust and scaling.

By W. L. GIEZENTANNER, Continental Oil Co., Casper, Wyo.

APPLICATION OF VAPOR phase cooling on 300-500 horsepower engines at remote electric generator stations in Wyoming eliminated overheating, reduced cylinder wear, cut oil consumption, and improved engine efficiency.

A vapor-phase engine cooling system consists of a steam separator, or vapor phase unit, and a steam condenser.

Water is circulated through the engine by circulating water pumps. Some of the water is vaporized and is carried with the circulating water to the steam separator. In the separator, the steam and water are separated with the water returning to the suction of the engine water pump.

Water is never intentionally cooled. Engine cooling is accomplished by utilization of the latent heat of vaporization of water; that is, by changing water to steam. One British thermal unit is required to change 1 pound of water 1° F., whereas it requires about 970 Btu. to change water to steam at no change in temperature at the boiling point. The rate of heat transfer to boiling water is much higher than to water below the boiling point, thus leading to the conclusion that lower temperatures near the combustion chamber should be accomplished with vapor-phase cooling.

Test results showed that the temperature at the hottest part of the engine head increases as the water

temperature is raised to 180 degrees. Beyond this water temperature, the temperature decreases as the water approaches the boiling point and is about 13 degrees cooler with the coolant at boiling than with the cooling water at 180 degrees.

Cooling with boiling water is accomplished with the hotter engine parts actually being cooler. Cooler parts of the engine are kept at a higher temperature. The heat transfer rate is dependent only on the temperature difference between the walls and the coolant, and with the temperature of the lower part of the cylinder raised, the temperature throughout the jacket is more nearly uniform, resulting in a straighter cylinder with less taper and improved piston clearance.

The temperature is controlled automatically by the atmospheric pressure at the boiling temperature whether the engine is loaded or idling. In the case where more than one engine is on the same system, the temperature is maintained even if the engine is inoperative.

It has been found that cylinder wear is reduced when the cylinder wall temperature is maintained above 194° F. but accelerated at lower temperatures. At temperatures below 122 degrees, rapid sludging of oil occurs along with scuffing of the piston skirt and rapid abrasion of the cylinder and piston rings.

Where engine radiators are used for condensers, the radiators are not a part of the engine cooling system. They are used to condense the steam so that the distilled water can be returned to the system to maintain water level.

Operation. The vapor-phase unit contains a built-in steam separator above the water level. A sedimentation chamber with the water outlet pipe extending up inside is built in at the bottom. Accessories include a liquid-level control valve connected to the water supply, a low-water alarm or shutdown switch, pop valve, pressure indicating gauge, air vent and vacuum breaker, gauge glass and blowdown valve.

Circulating water from the engine enters the vapor-phase unit tangentially, causing a swirling action inside. Any solids in the water are thrown down into the sedimentation chamber which is baffled to arrest the swirling motion and to trap the solids below the water outlet from where they can be blown down. Any salts of temporary hardness contained in the make-up water are precipitated by boiling inside the unit and thus prevented from entering the water jackets.

The condenser should be capable of condensing all steam generated at the highest encountered ambient air temperature when the engine is operating at maximum load. The result will be a completely closed system requiring only such make-up water as will be necessary to replace loss of water from leakage.

If the condenser becomes clogged with dirt, lint, or insects so that its capacity is reduced, some steam will escape through vent pipes placed at radiator outlets or through the safety vent valve at the vapor-phase unit. The engine can operate at full load under these conditions without overheating as the liquid-level control valve insures proper water level and the low water-level switch will sound the alarm or stop the engines in case of any failure of the supply of make-up water.

About the Author

W. L. GIEZENTANNER is district petroleum engineer for Continental Oil Company's Wyoming District, with headquarters at Casper. He was graduated from Oklahoma A. & M. College in June, 1942, with a B.S. degree in mechanical engineering. For the following 3½ years, he worked for the Boeing Aircraft Company in design engineering. He joined Continental in March, 1947, as a petroleum engineer, and was made mechanical engineer at Casper, Wyo., in January, 1950. In February, 1953, he was promoted to district petroleum engineer.

Advantages along with reduced cylinder wear are:

- Clean lube oil free from water and sludge.
- A minimum of acid in lube oil.
- Longer lasting oil.
- Improved combustion.
- Passages in the radiator core have no effect on water circulating rates in the engine.
- Oxygen, causing rust, is practically eliminated.
- Efficiency increased.

Prior to the vapor-phase installation at the Little Buck Creek electric generator plant, weekly trips were made during the summer months to determine the cause of engine overheating. It was determined that the overheating was caused by insufficient cooling capacity, especially when the wind was opposed to the cooling fans. It was recommended that vapor-phase cooling be installed to take advantage of the greater temperature difference.

Buck Creek Plant. This plant consists of three 6-cylinder, 150-horsepower, 4-cycle, 900 RPM, gas engines. The system was installed using one vapor-phase unit with the suction to the pumps manifolded as was the discharge from the engines. The manifold headers were connected to the vapor-phase unit. Piping sizes are critical in these systems and proved to be inadequate in this case. The main cause of inadequacy was higher-than-realized water pump capacity on the engines. With all three engines manifolded together, any two pumps would starve the third even after the suction header was changed to the next larger size.

It was determined that the system would operate if the pump discharge was restricted to reduce the pump capacity. This was satisfactory and the system operated until one of the restriction orifices became dislodged. The system was so critical with the orifices that it was decided to install smaller orifices. At the same time it was decided to place the orifices in the inlet to each bank of cylinders to preclude the possibility of starving or

shorting the water to any bank. This system operated satisfactorily as long as all engines were running but would fail when one engine was shut down.

Glass tubes were installed in the discharge lines of two engines to determine the cause of failure. It was found that when one engine was shut down, flow reversed through the inoperative engine pulling steam into the suction header and thus steam locking the pump on one of the remaining engines.

This difficulty was alleviated by placing check valves in the suction line to stop the reverse flow. This would have allowed the engine to cool when shut in so a small hole was drilled in the check valve. The hole allows the engine to be kept hot while shut down and also allows the engine to be more easily drained when necessary. It also shows that the check valve can leak without causing trouble. One reason that the back-flow existed to a detrimental degree without the check valve is that the discharge header size has not been increased and considerable pressure builds up in the header. This also raises discharge water temperature so that the engine is partly cooled by high-temperature cooling rather than vapor-phase cooling.

The system as installed ran through the summer months as follows:

June—No. 3 down with generator trouble.

July—No downtime.

August—No. 1 down 93 hours—loose valve seat.

No. 2 down 8 hours—magneto trouble.

No. 3 down 24 hours—replace gasket.

September—No. 3 down 36 hours—replace head gasket.

October—No. 1 down 144 hours—exciter trouble.

No. 2 down 4 hours—service engine and clean commutator on exciter.

No. 3 down 20 hours—relief valve stuck—no oil pressure.

When it is realized that the engines were down many times because of overheating the previous summer, the above record is indeed remarkable. The only down time possibly attributable to vapor-phase cooling would be the gasket trouble on No. 3 engine. A further study of the records showed decreased oil consumption.

Other Installations. Similar vapor-phase cooling systems have been installed on 6-cylinder, 2-cycle diesel engines at Circle Ridge and Maverick Springs and have been completely satisfactory. Prior to the installation of vapor-phase equipment, it was necessary to change oil at seven to ten-day intervals because of sludging conditions. Since the change, oil is changed monthly with no sludging and analysis shows the oil to be in good condition at the end of the month. The savings in oil changes alone, if all engines are in operation, will pay out the conversion in five years. The system was recommended and installed to effect savings on engine repairs, but has not been in operation long enough to indicate whether it is prolonging engine life.

The Sussex generator plant is vapor-phase cooled using condensers. The original plant consisted of three 6-cylinder, 180-HP, 514 RPM, gas engines. All three engines were installed at Sussex early in 1950. The No. 1 and No. 3 engines were operated on vapor-phase cooling for about four years. The No. 2 engine was not hooked up at that time and the rings were probably gummy when the engine was put into operation. It was overhauled because of a broken piston. The No. 1 engine was overhauled because of a bent crankshaft caused by misalignment of the generator. New rings and bearings were installed. The No. 3 engine was overhauled after over two years continuous running at Sussex to install new crankshaft bearings. Pistons and cylinders were miked showing almost no wear and were reinstalled. Only the bearings were changed.

A 6-cylinder, 300-HP, 4-cycle, 900 RPM, gas engine was later added to the same system.

Another vapor-phase cooled system was added when three 6-cylinder, 500-HP, 4-cycle, 514 RPM, gas engines were added to the plant.

Troubles at Sussex have been mechanical and not functional and have been solved. Insufficient cooling capacity was at first installed for the 500-HP engines because heat rejection figures were too low. The engines detonated and it was thought to be caused by the vapor-phase cooling system because of the higher jacket water temperatures. As heretofore shown, it is unlikely that combustion chamber temperatures are higher, but are possibly lower with vapor-phase.

Fuel Problems. Detonation, the result of a distinct change in the nature of combustion, is caused by characteristics of the chemical composition of the fuel. It is a cumulative spontaneous explosion of the fuel charge, very much more rapid than normal combustion and produces extremely high cylinder pressures and temperatures with consequent high stresses in the engine parts affected. Characteristic results of detonation are local overheating of cylinder combustion chamber and piston surfaces and severe erosion of piston crowns and sometimes of cylinder head inner surfaces. Detonation tendencies are aggravated by high compression ratio, high cylinder surface temperatures, and high mixture temperatures.

Gas engines are normally built with a compression pressure of 90 to 120 pounds per square inch to enable them to use a wide range of fuels. Units are being installed with compression pressures of 240 to 260 psi. for operation on high knock rating gas. The 500-HP engines at Sussex have a compression pressure of 290 psi., so they should have a tendency to detonate.

The compression ratio is 10 to 1. This means that each degree rise in mixture temperature will cause about two degrees rise in temperature at combustion pressure.

The combustion pressure at full load is 520 psi. The temperature caused by combustion pressure alone is in the range of 900° F. without heat caused by combustion. The temperature at the compression pressure is about 700° F. With these temperatures it is difficult to see that much temperature rise can be attributed to jacket water temperature.

It was learned by experimentation that the engines could carry full load without detonation by decreasing the air inlet temperature and at the same time change the chemical composition of the fuel by leaning the mixture

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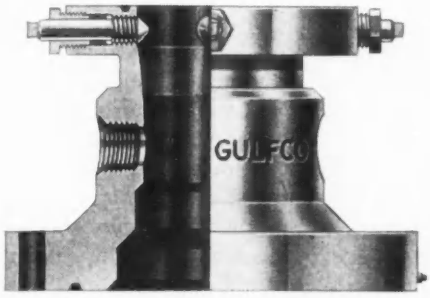
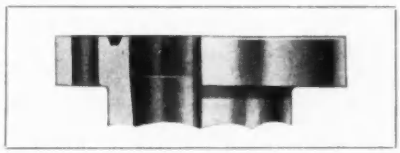
GULFCO FORGED STEEL TUBING HEADS AND HANGERS



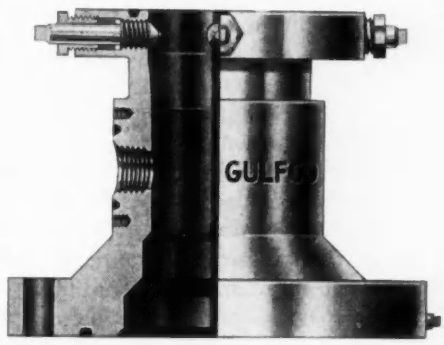
Type G-2F Threaded Side Outlets



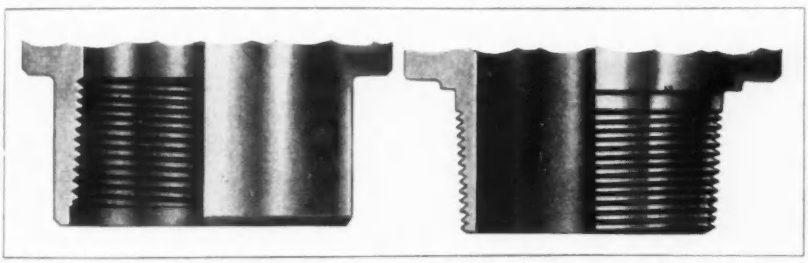
Type G-1 No Hold-Down Screws in Top Flange

These versatile full opening A.P.I. tubing head bodies are designed for maximum practical flexibility. All sizes have the same hanger seat design and all bottom flanges are bored for the Type O-2 seal and are provided with a test port.

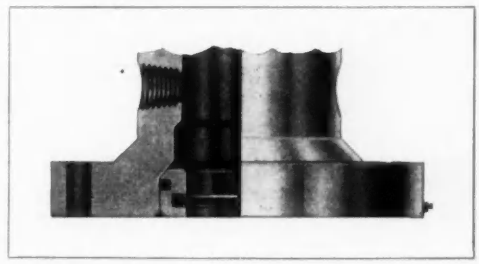
Below are shown hangers that are interchangeable in these bodies. Extra heavy hold-down screws are provided in the top flange of the Type G-2 and G-2F.



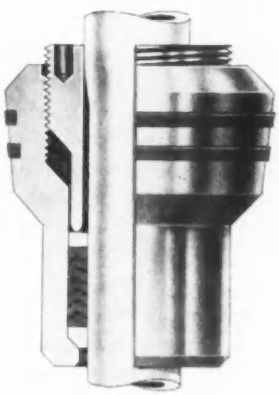
Type G-2F Padded Side Outlets



Type G-1 and G-2 Optional Female or Male Threaded Bottom Connection

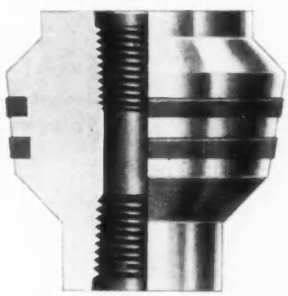


Type O-2 Seal in Lower Flange of G-1F or G-2F



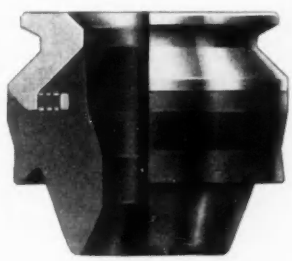
Type PR-2

This "polished joint" hanger is used when setting a packer—or in any dual zone operation which requires raising or lowering the tubing under pressure.



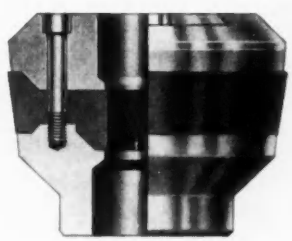
Type T-2

"Boll Weevil" or mandrel hanger with high pressure hydraulic packing seal . . . with or without hold-down screws.



Type S-6

This unique stripper is interchangeable in the G-1, G-2, and "FW" Tubing Head Bodies and can be used with all the various adapters.



Type LA-2

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and retarding the spark. This limits engine response. The detonation tendency can be remedied by locating the air cleaner outside the building.

It was learned that a change of 40° F. on the coolant had no effect on detonation. The mixture and ignition timing were set just below detonation with jacket water temperature at 205 degrees. Pressure was held on the system until the temperature increased to 245 degrees without detonating.

While the experimentation was being carried on, it was thought that the detonation might be caused by carbon accumulation in the combustion chamber since this had happened on this type engine elsewhere. A piston was pulled and no carbon was found after ten months operation.

Performance. These engines usually begin operation with operation time of about 7000 horsepower hours per gallon of oil, decreasing to about 3000 horsepower hours per gallon before an overhaul is necessary. The operating time on the 500-HP engines had decreased after ten months operation to 7000 horsepower hours per gallon.

Vapor-phase equipped engines require the same air treatment as any engine with hot and dry intake. Vapor-phase cooling solves many problems and has many advantages already proven in our plants. It will not solve problems in no way related to the cooling system. We will still have magneto troubles, oil pump troubles, generator and exciter troubles if we depend on vapor phase to stop them. Radiators will still clog and cause loss of coolant although it has already been shown that this will not cause down time, but merely requires the addition of water to the system without shutting down. Condensed water from the radiators goes to a hot well from where it is pumped back into the system through the liquid level control valve.

Additional Energy. The most obvious and money saving advantages of the system is that it recovers nearly all jacket heat plus facilitating a method to obtain 50 to 60 percent of exhaust heat, in its most usable form: steam at 0 up to 25 pounds pressure. This heat can be used to air-condition buildings, refrigerate, heat viscous oil and treat crude oil. Engine efficiency can be greatly improved by using steam generated in the water jackets to treat oil. This can be done where power is generated to artificially lift wells and the power stations and tank batteries have been unitized.—**The End.**

ACKNOWLEDGMENT

This paper presented before the Rocky Mountain District Meeting, API Division of Production, held in Casper, Wyo., May 8, 1953.

Miss Smith, put Bentley down for a promotion. He at least knows he can find the answers in the World Oil files.

Dynamometer Cards . . .

Continued from page 180

with the help of dynamometer cards. This well was equipped with conventional pumping equipment. Percentage of oil to water decreased as the well continued to pump. Although the well was slightly overbalanced when it was put on the pump, the fluid load changed and caused the counterbalancing effect to become insufficient. This condition was detected quickly by the dynamometer, and the addition of weights brought the counterbalance effect up to the dashed lines shown in the card above.

•

There are many examples of dynamometer applications which have resulted in cutting operating and repair expenses. Some outstanding uses have been in reducing expenses for gin pole rigs after pulling a pumping well and replacing either a bad pump, tubing or rods. Normally, such a rig is retained until it is definitely determined that the well is pumping properly. This procedure may require from two to four hours of standby time at hourly rates up to about $16.75 per hour. This expense can be and has been eliminated on occasions by utilizing the dynamometer to determine if an increase in polish rod load is taking place after starting the pumping unit. The determination usually takes about 30 minutes, after which the rig can be released unless trouble is encountered.

The dynamometer has been used to good advantage in determining the source of trouble prior to remedial work in a pumping well. An example of this is a simple case of tubing leak. Without the dynamometer data to pin-point this trouble, the pump is often pulled and replaced as the first step in attempting to restore a pumping well to full production. It is readily seen that by trial and error the trouble eventually will be found and corrected, but at considerable greater cost. The dynamometer in the hands of an experienced operator could have determined the trouble prior to commencing work and would have resulted in large savings in well repair expenses, thus reducing lifting costs. —**The End.**

ACKNOWLEDGMENT

The author appreciates the permission granted by Gulf Oil Corporation for the publication of this article.

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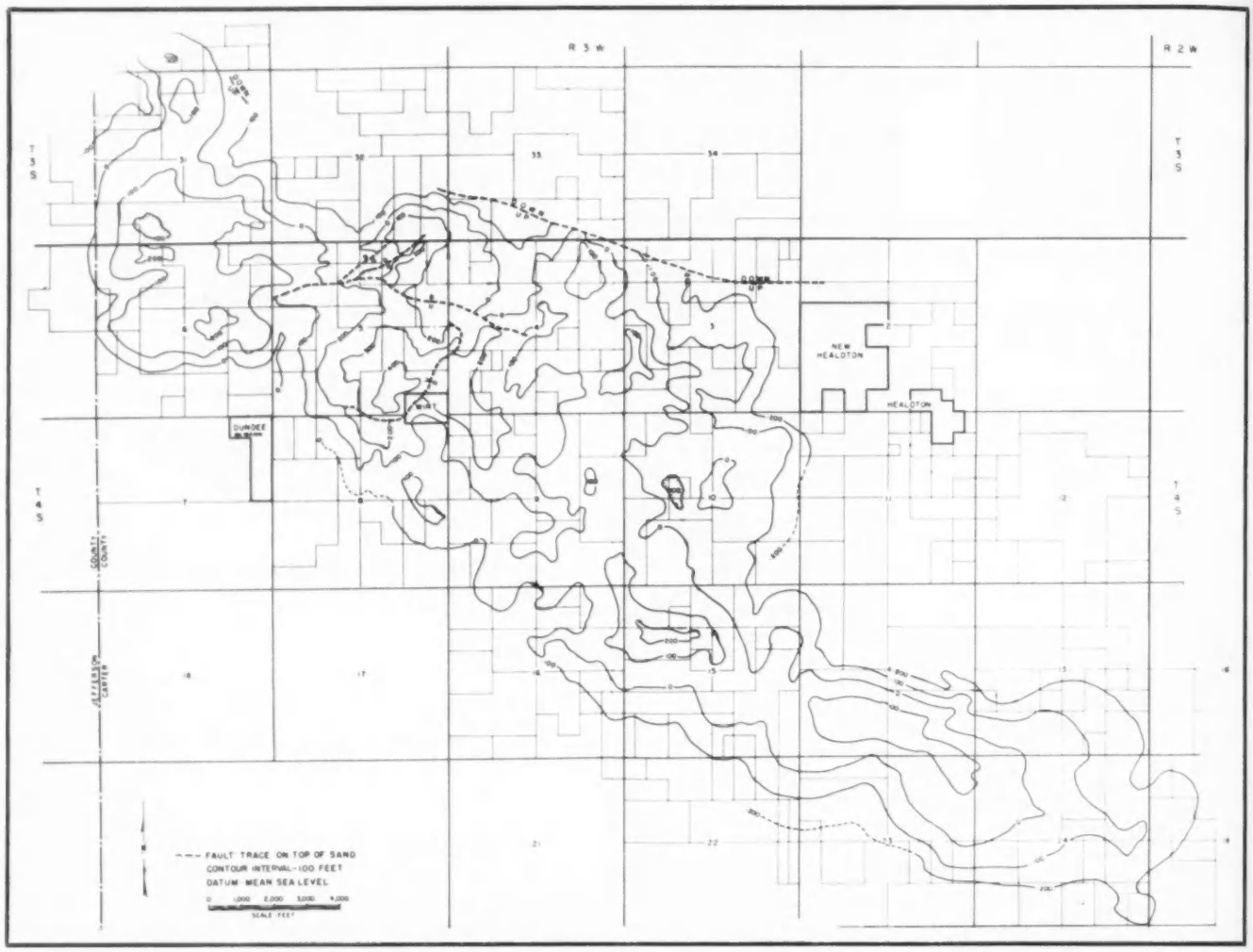

Fig. 1. Structure of the top of the first Healdton Sand, Healdton Pool, Carter County, Okla.

Healdton Has Big Waterflood Potential

The equivalent of two major discoveries can be recovered in this producing area. Here are the figures to support such a project.

By C. H. RIGGS and JOHN E. WAY
U. S. Bureau of Mines, Bartlesville, Okla.

EFFICIENT WATER-FLOODING of the old Healdton pool of southern Oklahoma can result in the production of new oil equivalent to the discovery of two major oil fields of 100 million barrels each. Approximately 200 million barrels of new oil reserves still remain in the pressure-depleted sands at Healdton and this badly-needed crude can be economically recovered through waterflooding. Healdton, discovered in 1913, to date has produced approximately 211 million barrels of oil. The pool is located in western Carter County approximately 20 miles west of the city of Ardmore, and was one of the early important oil-producing areas in Oklahoma. A summary of data pertinent to the Healdton pool is presented in Table 1.

Reservoir Conditions. The field produces from lenticular Healdton sands of late Pennsylvanian age which range in depth from 700 to 1400 feet. Apparently these sands were deposited unconformably around and over a topographic high of the eroded Ordovician surface. During Mesozoic time, the area was folded and faulted to form a modified anticlinal structure. Figure 1 shows the structure of the Healdton field by contours drawn on top of the Healdton sand zone.

Healdton sands are considered as belonging to four zones, the uppermost of which is termed the first-sand zone, and the lowermost, the fourth-sand zone. The structure and stratigraphy of these zones is shown by the cross-section Figure 2.

The fourth sand covers a relatively smaller area, is more uniform in character and in this report is con-

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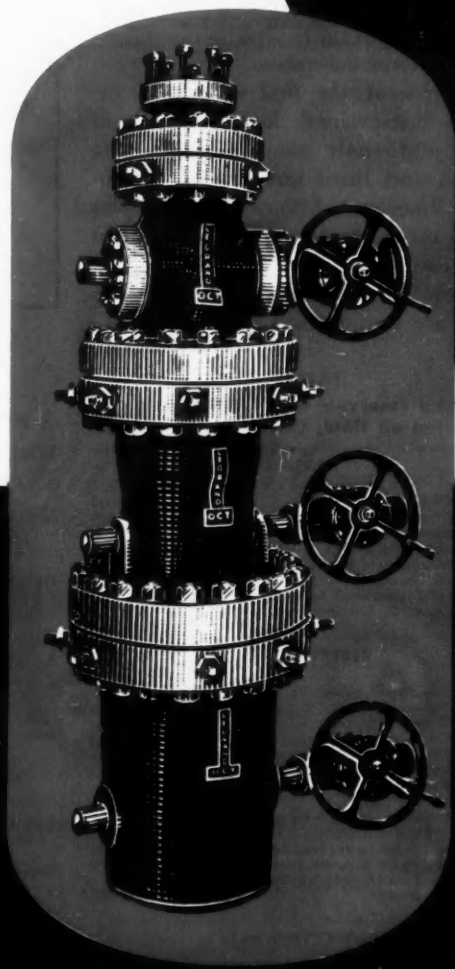

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sidered as a separate reservoir under the influence of a definite water drive. The upper three sands which lack the benefit of this natural water displacement are considered most suitable for water-flood development.

Calculations of Stock-Tank and Mobile Oil. Volume of stock-tank oil originally present in the Healdton reservoirs was calculated for individual leases by the following formula:

$$S.T.O. = 7758 \times A \times T \times P \frac{(1 - C_w)}{FVF}$$

where:

S.T.O. = original oil, measured at stock-tank conditions, bbl.
7758 = conversion factor, acre-feet to barrels
A = area of sand, acres
T = effective thickness of sand, feet
P = average porosity of sand, decimal fraction of total volume
C_w = average connate-water saturation, decimal fraction of pore space
F.V.F. = formation-volume factor

In general, the first sand zone includes fine-grained, loosely cemented sand and shaly sand, whereas the second and third sand zones contain more limestone. Several core samples from these sands were analyzed in the Bureau of Mines laboratories and the results of measurements on these cores are summarized in Table 2.

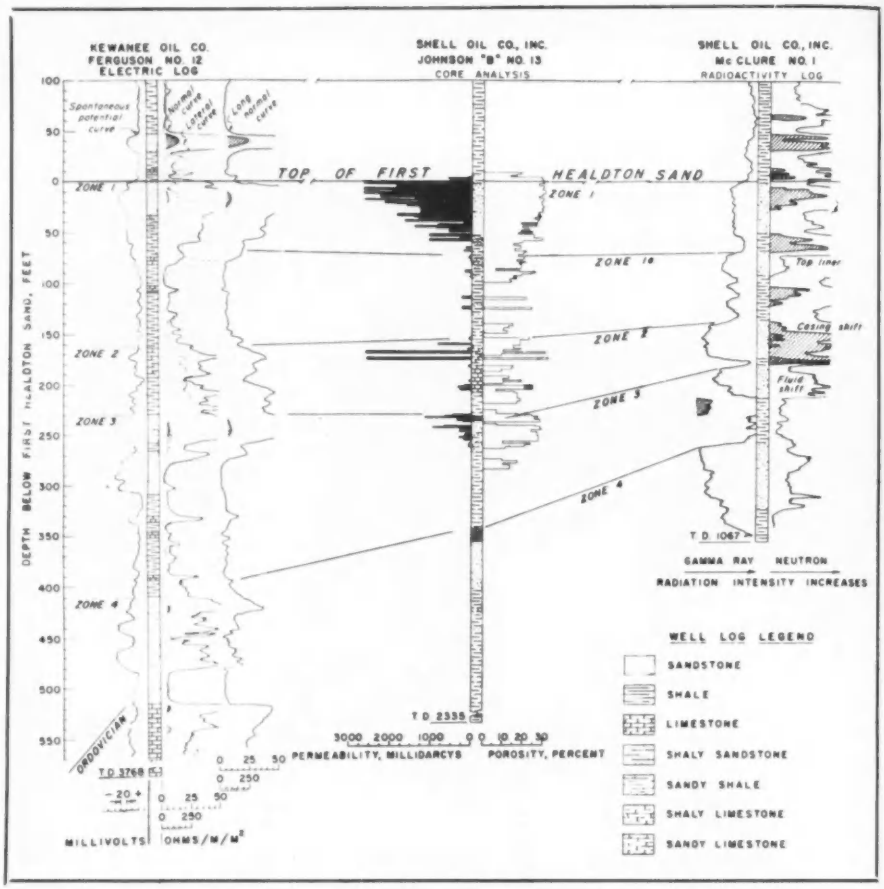

Fig. 2. Correlation of well logs showing Healdton sand zones.

TABLE 1

Field and reservoir data, Healdton sands, Healdton oil field, Carter County, Okla.

GENERAL	
Date of Discovery	Aug. 14, 1913
Depth of Wells, Ft	700 to 1,400
Total Productive Area, Acres	7,142
Total Wells Drilled to Nov. 1, 1951	2,590
Wells Producing as of Nov. 1, 1951	1,863
Stock Tank Gravity of Oil, A.P.I.	26 to 35
Viscosity of Typical Stock tank Oil of 31° A.P.I., at 80° F., Centipoise	13.3
RESERVOIR DATA	
Average Effective Thickness, Ft	72
Average Porosity, Percent	21.6
Average Permeability, md	330
Average Connate Water Content, Percent	18.2
Average Original Reservoir Pressure (Estimate), psig.	270
Average Formation Temperature (Estimate), °F	80
Gas in Solution in Reservoir Oil per Barrel of Stock Tank Oil (Estimate), Cu. Ft.	85
Formation Volume Factor (Estimate)	1.044
Original Mobile Oil Reserves, Barrels	422,000,000
Total Stock Tank Oil Originally in Reservoir, Barrels	674,195,000
PRODUCTION DATA	
Average Initial Oil Production between 1913 and 1917, per Well per Day, Barrels	270
Max. Yearly Oil Production, 1917, Barrels	22,036,000
Yearly Oil Production, 1950, Barrels	2,263,000
Average Daily Oil Production, 1950, Barrels	6,200
Average Daily Water Production, 1950, Bbls	14,600
Average Specific Gravity of Produced Gas (Estimate)	0.88
Gasoline Content of Produced Gas as of Jan. 1, 1951, per M. Cu. Ft., Gallons	0.31 to 3.95
RECOVERY	
Cumulative Oil Production to Jan. 1, 1951, Barrels	211,179,000
Oil Recovery to Jan. 1, 1951, Field Average per Acre, Barrels	29,570
Oil Recovery to Jan. 1, 1951, field Average Barrels per Acre Foot	410

Mobile oil for each lease was calculated by deducting non-recoverable oil (29 percent of the pore volume) from the original stock tank oil in place.

Total stock-tank and mobile oil originally present in the several Healdton sands as calculated by a summation of lease totals is shown in Table 3.

Production. The Healdton field has been one of the most prolific oil-producing areas in Oklahoma. Cumulative oil production to Jan. 1, 1951,

TABLE 2

Laboratory measurements on Healdton sand core samples, Healdton oil field, Carter County, Okla.

Core No.	Porosity, Percent	Permeability, Millidarcys	Formation Factor[1]	Connate Water, Percent of Pore Space[2]	Clay, Volume Percent	Limestone, Volume Percent	Average Grain Size, mm.
1	2	3	4	5	6	7	8
					1st Sand		
5	29.0	4,200	6.24	11.3	8.4	3.2	0.326
6	27.6		5.77	24.7			.176
7	27.0	530	8.53	15.4	13.4	3.6	.151
8	21.8		6.37	28.1	24.8	6.6	.159
9	27.8	1,300	11.44	16.8	9.9	4.3	.184
10	20.8		9.45	43.6	29.8	6.5	
11	19.1	21	13.10	18.6	20.1	4.2	.134
12	6.9	110	45.41	34.3	5.5	34.2	.241
					2nd Sand		
31	29.1	740	11.52	7.1	2.2	7.6	0.166
32	11.9	3.7	34.83	23.8	3.5	31.2	
33	20.7	170	9.55	6.1	4.6	21.2	.153
34	8.7	7.1	45.72	24.2	4.1	37.1	.181
					3rd Sand		
38	27.4		9.07	12.3	12.5	2.6	
39	27.1	2,600	6.81	13.2	6.9	21.3	0.246
40	30.1	2,900	6.27	8.1	16.5	0	.255
					4th Sand		
41	10.5	0.4	71.40	56.2	4.5	33.2	
42	27.3	870	7.00	11.9	9.2	6.5	0.200

[1] Formation Factor = $\frac{\text{Resistivity of Core at Maximum Brine Saturation}}{\text{Resistivity of Brine}}$

[2] By Restored State Method, Displacement at 50 p.s.i.

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from 7142 productive acres of Healdton sand is more than 211 million barrels, averaging 29,570 barrels of oil per acre, and 410 barrels per acre-foot. Oil recovery from several leases was greater than 120,000 barrels per acre. With few exceptions, this oil has been recovered by primary-production methods utilizing the natural energy of the reservoir fluids.

Between 1925, when annual oil production was 5¼ million barrels, and 1950, when it was 2¼ million barrels, a total of 88½ million barrels of oil was recovered from Healdton sands. During this interval the over-all decline rate was less than 3½ percent per year, much lower than that of most fields of comparable age. Additional drilling, deepening of wells to new sands, and cleanouts of old wells have sustained this oil production rate. Very little is attributable to gas injection operations.

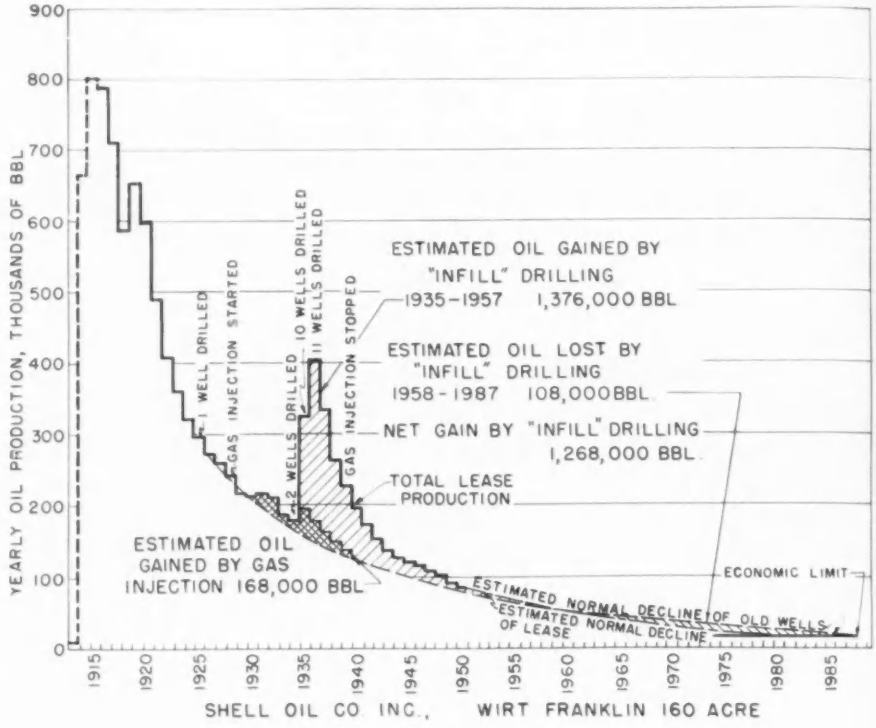

Fig. 3. Oil production history of Shell Oil Company's Wirt Franklin lease, comprising 160 acres.

Representative of the comparative results obtained by gas injection and by additional drilling, is the oil production history of the discovery lease shown in Figure 3. For ten years beginning in 1929, gas was injected into several wells in the center of the lease, resulting in an increased oil recovery estimated at 168,000 barrels. In 1934 and 1935, 23 "infill" wells were drilled on the lease and the resulting increase in yearly oil production greatly overshadowed the increases attributable to gas injection. However oil production now is declining at a rate more rapid than would have been expected from the original wells, and it is estimated that after 1957, the yearly oil production from all wells on the lease will be less than it would have been from the original wells alone. To an estimated economic limit in 1987 it is estimated that the total net gain from the drilling of the 23 additional wells should be in the neighborhood of 1,268,000 barrels.

However, present production methods including gas injection and infill drilling, cannot be expected to recover, in a reasonable time, the large oil reserves still trapped in the Healdton sands. Since little if any of the original reservoir pressure remains, only that relatively small pressure differential created by vacuum application, and by gravity is now acting to move oil to the wells.

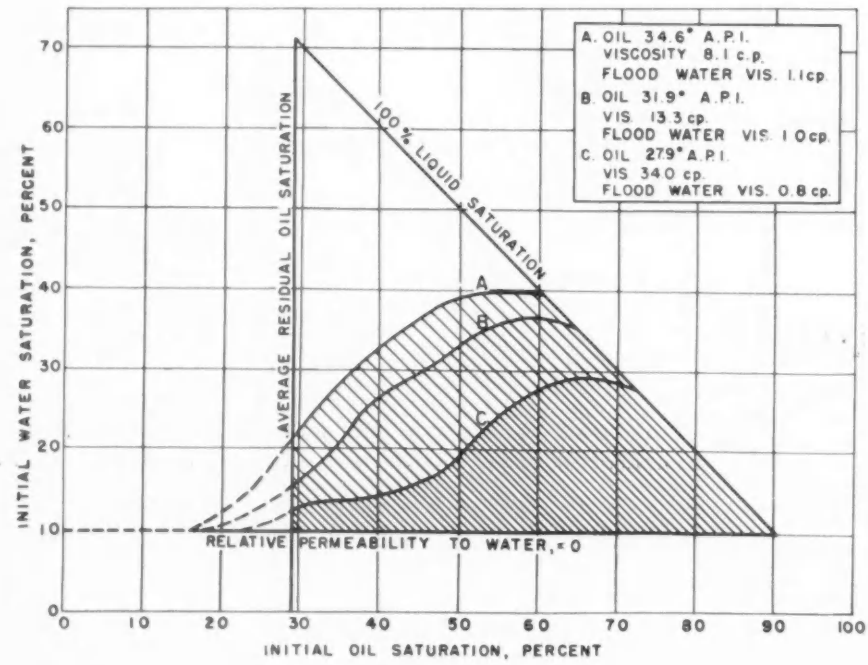

Fig. 4. Limiting initial liquid saturation for successful water flood of loosely consolidated sands in Healdton pool. (After data by Leverett and Lewis).

Water-Flooding. Injection of water into partly depleted oil-bearing sands simulates a natural water drive and is

TABLE 3

	Original Stock-Tank Oil Thousands of Barrels	Original Mobile Oil Thousands of Barrels
Upper Three Healdton Sands	590,448	369,765
Fourth Sand	57,026	35,455
Stray Sands	26,721	16,780
TOTAL	674,195	422,000

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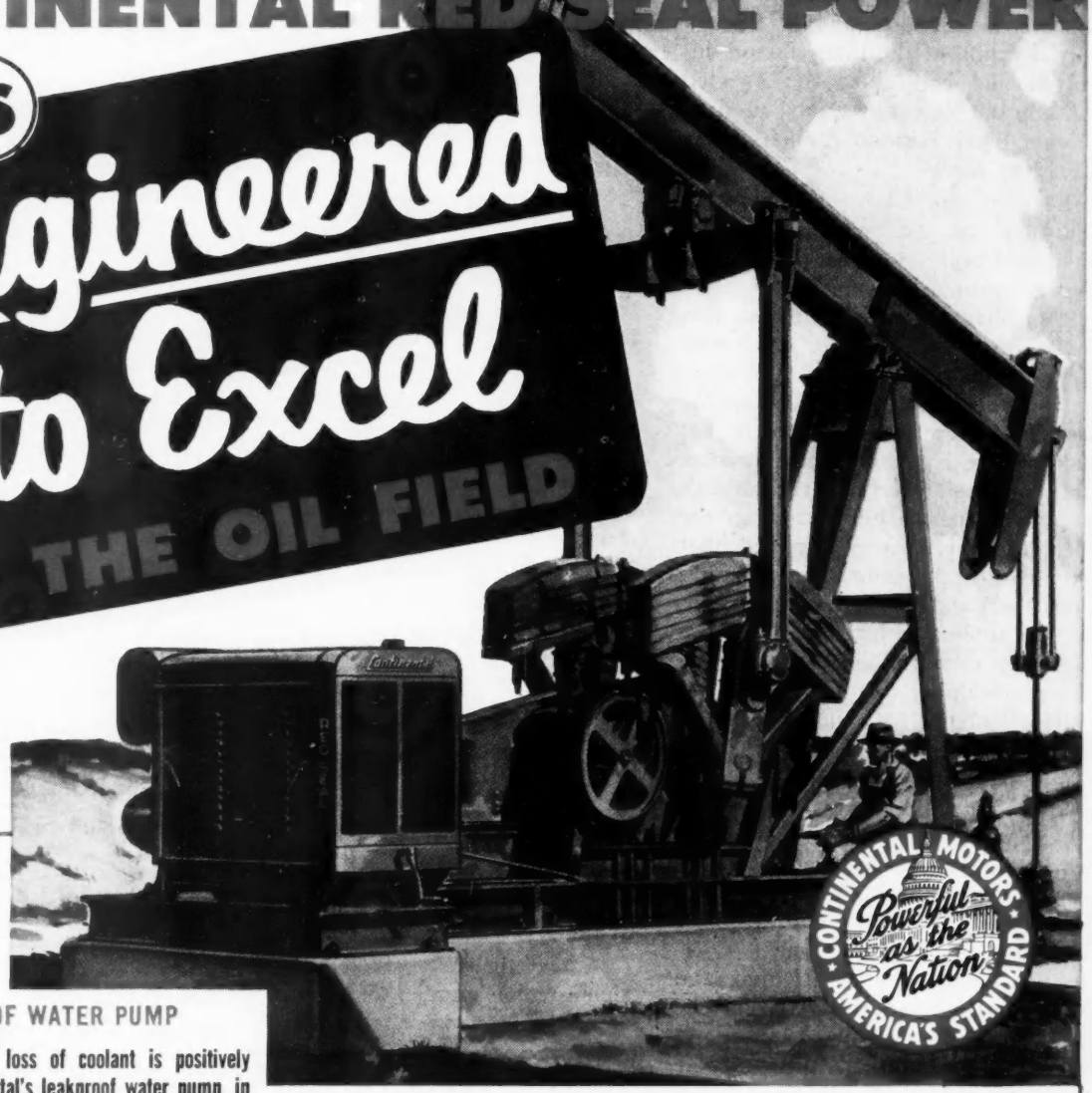

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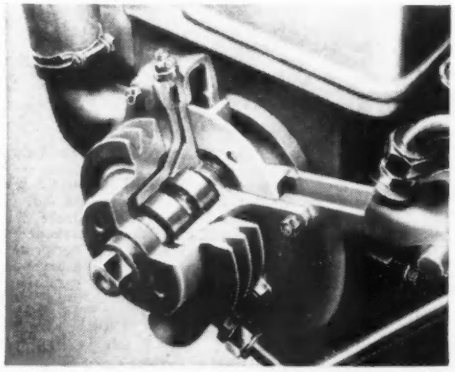

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the most efficient secondary recovery method in common use. By careful consideration of the many factors involved and control of the injected fluid, water-flooding can be used to recover much additional oil from the Healdton sands.

Leverett and Lewis[1] have shown that in unconsolidated sands the relative permeability to either oil or water depends primarily upon the saturation of that phase. Their experiments were made on unconsolidated sands and their quantitative results are exact only for loose sands. Inspection and analyses of core samples indicate that many of the Healdton sands are loose or poorly cemented. In the absence of relative permeability data on the Healdton sands, it is assumed that with care and within certain limitations the data of Leverett and Lewis can be applied to many of the sands in the Healdton field to indicate relative permeability.

The mobility of a liquid depends upon the relative permeability of the sand to that liquid and upon its viscosity. The mobility ratio of two liquids, the comparative ease with which they will move through a sand, depends directly upon the relative permeabilities of the sand to those liquids and inversely upon the viscosities of the liquids. If the ratio of the mobility of the water to the mobility of the oil is less than one, a bank of oil is formed ahead of the water when it is injected into an oil sand, and a water flood will be successful.

In an attempt to apply mobility ratios to water-flooding of the Healdton oil sands, Figure 4 was constructed to show the limiting initial oil and water saturations which, at representative viscosities, would result in a mobility ratio of 0.9. A mobility ratio of 0.9 instead of 1.0 arbitrarily was selected to provide a safety margin of oil saturation which would assure the formation of an oil bank ahead of injected water.

Curves "A," "B", and "C" (Figure 4) show the minimum oil and maximum water saturations permissible to water flood Healdton sands successfully under assumed flooding conditions.

Curve "A" is the limit of liquid saturations in percent to permit a mobility ratio of 0.9 for an oil viscosity of 8.1 centipoises and a flooding water viscosity of 1.1 centipoises. This combination of oil and water viscosities is considered to include the widest range of floodable liquid saturations possible in the Healdton field. Curve "C" marks the limit of liquid saturations for an oil of 34.0 centipoises viscosity and a flooding water viscosity of 0.8 centipoises which would include the narrowest range of permissible liquid saturations in the Healdton field. Curve "B" represents the limiting liquid saturation conditions for the average oil in the Healdton field, oil 13.3 and water 1.0 centipoises.

In Figure 4, the shaded areas bounded by the three curves, "A", "B", or "C" are those areas which contain the combinations of water and oil saturations which in the Healdton sands could be flooded successfully. The area above any of these curves includes saturations unfavorable for water-flooding; oil saturations too low or water saturations too high to permit the formation of an oil bank.

Sources and Treatment of Water. In considering water-flooding of oil sands in the Healdton field an adequate volume of water for injection probably would be one of the most important problems confronting the operators.

Many of the wells drilled in the field penetrated a number of upper Permian sands that were reported by the driller as water-bearing but it is problematical whether an adequate volume of water could be produced from this formation. Although considerable water is produced with oil in the Healdton field, the volume of the water produced on any lease would not in itself be adequate for a regular water-flooding project.

A brine sample produced from an Ordovician well drilled in 1924 and which reported a large volume of water has been analyzed and found satisfactory for injection. The possibility of using waters from Ordovician formations as a supply source should be investigated further.

Methods of water treatment in use in Mid-continent fields are described in a recent Bureau of Mines report of investigations.[2]

Water-Flooding Calculations. Suder and Calhoun have presented a method for predicting the water-flood behavior of a property from core analyses data and water injection pressures.[3]

An adaptation of this method, assuming a constant injection rate of 500 barrels of brine daily, was used to predict the probable water-flood behavior of a 660-foot, 5-spot pattern on one of the leases in the Healdton field. In this calculation the sand, 34.7 feet thick, was considered as 17 separate horizontally homogeneous beds with an average oil saturation of 35 percent and an average water saturation of 14.2 percent. Porosity of the individual beds ranged from 18 to 39 percent and permeability from 300 to 3120 millidarcys. Assuming a 72 percent sweep efficiency when injected water first reaches the producing well and no oil recovery from that bed after this "break-through," calculations for the 5-spot would be as follows:

Total injected water to effect first flood production.....171,000 bbls.
First Flood Oil Production after injection started.....11 months
Peak flood oil production after injection started.....17 months
Residual oil saturation in swept areas .....29 percent
Total life of flood to 99 percent water production.....7 years
Total oil recovery....3470 bbl/acre

These calculations are exemplary only and the results should not be construed as predicting the actual water-flood behavior of any particular lease. These data and discussions are presented to encourage oil operators to examine the water-flooding possibilities of leases in the Healdton oil field.

EDITOR'S NOTE

This article was especially prepared for WORLD OIL and is based on an extensive study of water-flooding possibilities at Healdton as contained in the U. S. Bureau of Mines Report of Investigations 4917.

ACKNOWLEDGMENT

This study was conducted by the Bureau of Mines under a cooperative agreement with the State of Oklahoma. The writers gratefully acknowledge the cooperation and assistance of C. W. Tomlinson, S. W. Hamner and Elbert King of Ardmore, Okla. Sincere thanks are extended to the operating companies and their field personnel, who by furnishing production data and other pertinent information have made this report possible.

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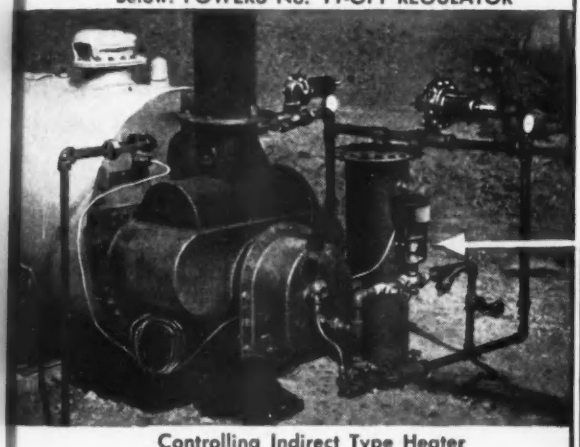

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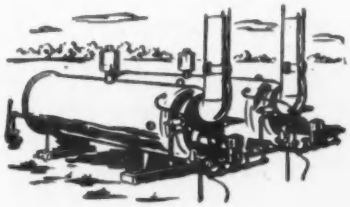

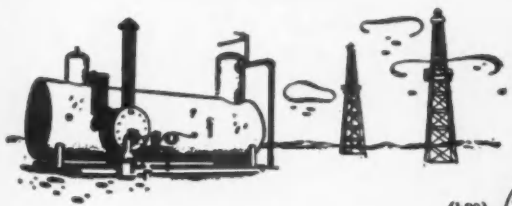

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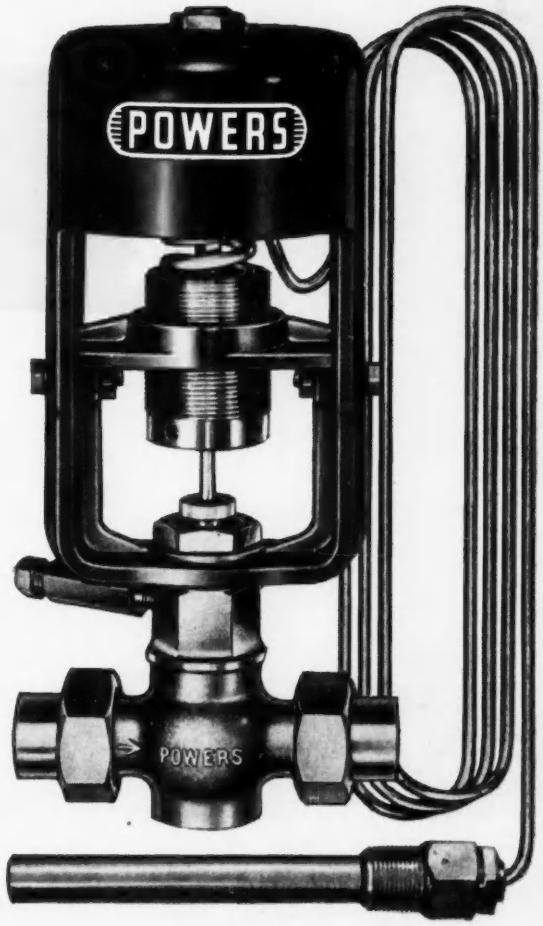

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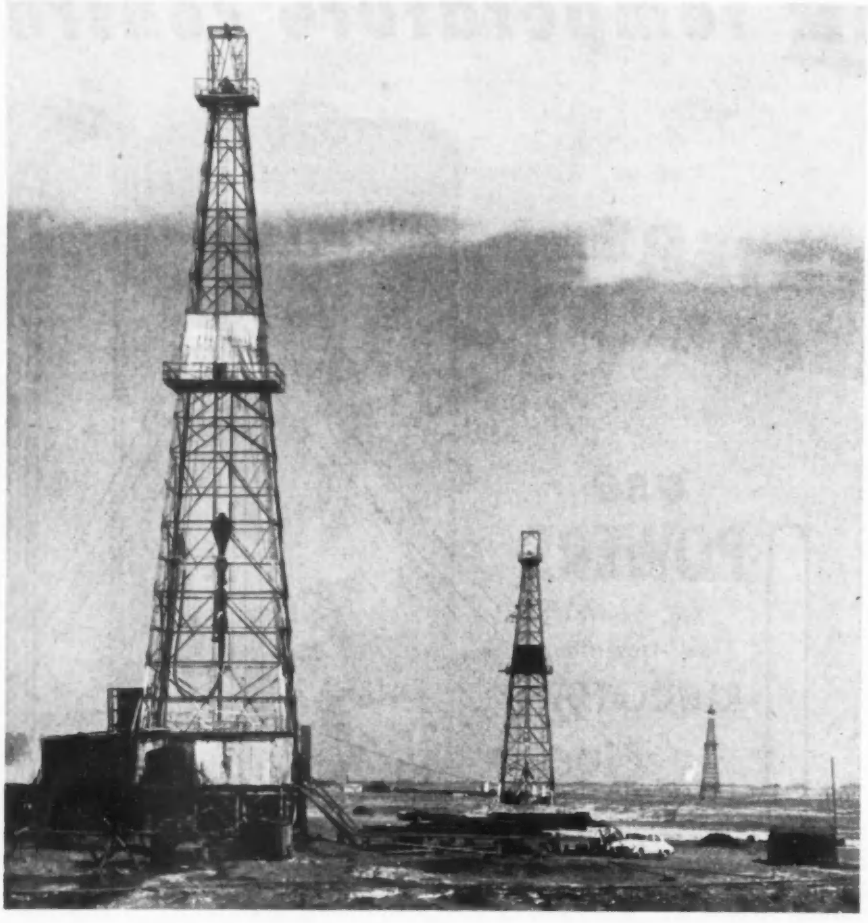

Photo Courtesy Shell Oil Company

THE ELK CITY FIELD of Oklahoma has been unitized. The unit includes more than 200 producing wells on approximately 8000 acres owned by 14 operators. Shell Oil Company operates the unit.

Unitization . . . and How It Works

Some operators find it complicated. But the agreements are logical and are working in more than 1000 projects in U. S.

By C. H. KEPLINGER AND J. M. WANENMACHER
Consulting Petroleum Engineers, Keplinger and Wanenmacher, Tulsa

UNITIZATION OF OIL properties is necessary in some cases in order to obtain the greatest ultimate recovery of petroleum and associated minerals and to conserve oil and gas resources. Nevertheless, not a few operators are indifferent to the advantages offered by unitization while many are without knowledge or experience of this important operational procedure. In some states the principle of unitization has been overlooked entirely. For example, California has no legislation which applies to unitization. But the advantages are so apparent that it is estimated 15 percent of California's production is produced from unitized properties. Past experience shows that unit operations can be carried on successfully in the manner described in this article.

Unitization of leasehold interests became common shortly after the start of the depression in 1929. Most units were formed by owners of leasehold interests for the purpose of sharing the cost of exploratory wells. In most instances the royalty interests were not unitized. In recent years, most units have been formed after a field is partially or completely developed and royalty interests are usually unitized as well as leasehold interests. The number of unitized projects in the U. S. is probably more than 1000 at this time.

Most of the early units and a few of the more recent units were formed to share the cost of exploring wildcat leases. Objectives stressed in the early unitizations include the following:

- Reduction of development cost by eliminating unnecessary wells which would be drilled under competitive operation.
- Lower operating cost.
- Conservation and increased recoveries resulting from elimination of competitive operation.

Most unitizations in recent years have been accomplished in developed fields as a preliminary to projects involving secondary recovery, pressure maintenance by injection of water or gas or cycling of gas-condensate reservoirs. These operations usually require unitization of mineral interests as well as lease-hold interest to protect correlative rights. Increased recovery and profit is the prime objective.

Basis of Unitization and Participation. In instances where units are formed before development and for the purpose of exploration the interests of each participant is often based upon the size of leases contributed. However, provision may be made for a readjustment of interests after the productive area is defined.

When units are formed for pressure maintenance or gas cycling participation, factors are usually based upon the estimated amount of oil or gas in place under each leasehold or some factor considered representative of the reserves such as the volume of productive formation.

In older fields, where secondary recovery operations are contemplated, factors considered include one or more of the following:

- Cumulative production
- Primary recovery
- Acreage
- Number of wells

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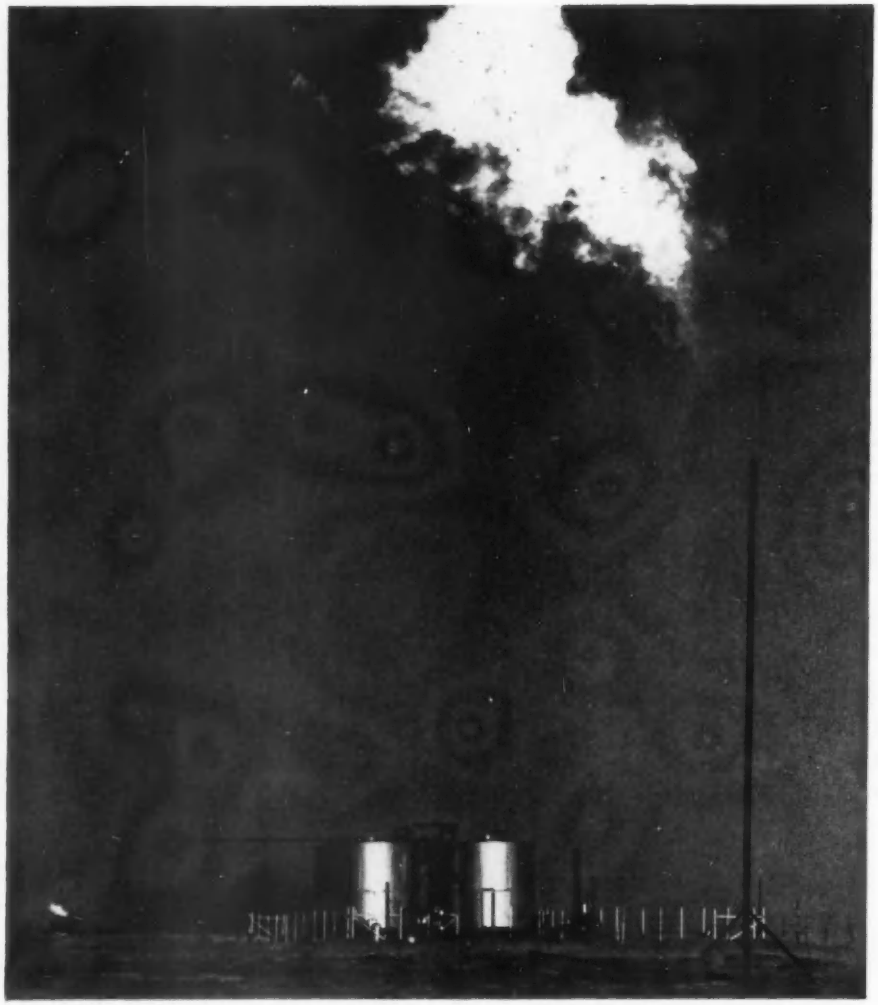

WASTEFUL FLARING OF GAS such as this is eliminated by unitization. This picture was made in a Mid-Continent oil field that is not unitized.

- Current production rate
- Volume of productive sand (or average thickness)

For some fields being unitized for secondary recovery operations, the participation factors have been formulated to minimize the immediate raising or lowering of current income. The unitization of the Salem Field in Marion County, Ill., is an example of this type. Two methods of participation were developed, one of which was the participation in primary reserves and the other the participation in secondary reserves. The effect of using the two formulae, commonly referred to as the "split formula," is to maintain incomes of the respective operators at approximately their current levels; and by the time the secondary recovery factor becomes operative, the production of the field should have increased considerably so that there are no abrupt income changes to the operators.

Forming the Unit. The first step in forming a unit is an engineering study. This may be made by engineering consultants or by a committee of company engineers. All basic information accumulated by the owners of leaseholds is made available for this study. The results of the engineering study are usually submitted to the lease owners in the form of a report and include the following:

- A summary of factual data.
- Conclusions and recommendations as to feasibility of secondary recovery operations, pressure maintenance or gas cycling.
- Estimates of increased recoveries.
- An economic analysis setting forth the anticipated expenditures, operating expense and profit.
- Details of the proposed program and a plan of operation. This may include an experimental operation in a small part of the field.
- Calculation of participation factors.

The engineering study may formulate and recommend participation factors or it may merely compile the basic engineering data from which participation factors acceptable to a majority of the operators may be agreed upon.

The operator of the unit is usually selected at an early stage in the formation of the unit. The owner of the largest interest is usually selected as the operator. In some instances, however, the owner of a lesser interest may be selected because of his experience in the proposed operations. All owners of leaseholds are members of an operators committee. The operating committee meets at intervals during its investigation. The operating committee collects funds from members and disburses these funds to meet expenditures during the formative stage of the unit.

When unitization is agreed upon and participation factors are decided the operators sign an agreement setting forth the participation of each leasehold owner, the area to be included in the unit, regulations for future operation, the method of payment of accounts, etc. The leasehold owners then exchange assignments. In the meantime the owners of mineral interests and royalty are requested to sign an agreement unitizing their interests on the same basis as the owners of the respective leaseholds.

At the time of unitization complete inventories are taken and cash adjustments are made to equalize the value of equipment contributed to the unit in conformance with the participation factors.

It is not always possible to obtain the consent of all operators and all royalty owners to a plan of unitization. Statutes in Oklahoma and Arkansas provide for compulsory unitization of a field when a designated percentage of all the owners of leasehold and royalty interests agree to and approve the proposed plan; however, it is necessary to hold a public hearing before the state commission responsible for conservation of oil and gas to secure an order before compulsory unitization can be instigated. In other states, hearings are usually held prior to unitization, but the participation of the various interests is not compulsory. The unit is often formed when as much as 90 percent of the

interests favor the plan of unitization. The leases which are owned by parties objecting to unitization are not included. However, objection by the owner of a royalty interest is usually not considered sufficient grounds to omit the lease if the owner of the leasehold joins in the project.

Leases on government lands supervised by the U. S. Geological Survey may be unitized under rules and regulations issued by this agency. However, the formation and operation of the unit is subject to certain restrictions not usually applicable to units on non-government lands.

Most unit agreements are so worded that each leasehold owner markets his share of the products. This provision is included to avoid the unit being construed as a separate corporation by the Treasury Department and subjected to taxes in addition to those paid by the participating leasehold owners.

Operation of Unit. After the non-operating members have chosen the unit operator, it becomes his duty to develop and operate the unit in accordance with best practices and in conformance with the instructions of the operating committee and terms of the unit agreement.

The unit operator is entrusted with the following obligations:

1. Conduct all unit operations in a good and workmanlike manner.

2. Pay all costs of drilling, equipping and operating the unit and handle any litigation arising from such development and operations.

3. Keep full and correct books, accounts, and records of its operations which shall be made available for inspection at all reasonable times by any of the participants. It is customary for the non-unit operators to audit the accounts of unit operators once a year. This is done by an Audit Committee composed of interested parties.

4. Mail to each non-operator a monthly statement showing the following information:

a. Monthly fluid production (oil, gas & water).
b. Results of individual well tests (each well should be tested a minimum of once each month).
c. Cumulative fluid produced (oil, water & gas).
d. Number of producing wells.

If the unit is a secondary recovery project the information listed below should also be submitted:

e. Amount of fluid injected into each injection well during the month.
f. Injection wellhead pressures.
g. Cumulative fluid injected.
h. Number of fluid injection wells.

5. Furnish each party such reports and records of operations so that all concerned will be fully informed. Monthly reports of drilling results and progress reports concerning results of secondary recovery operations are usually necessary.

6. Submit to the operating committee for approval details of proposed drilling operations, design of equipment required, and detailed estimates of cost. It is a customary policy for the unit operator to have frequent meetings with the operating committee if the operations are in a planning or pilot state.

7. Procure sufficient production and accounting information and engineering data to permit the operation of the unit facilities in such manner as to promote efficient operations, conserve oil and gas, and comply with all valid laws, orders, rules, and regulations made by duly constituted governmental authorities.

8. Render each party a statement in detail of all receipts and disbursements during the preceding calendar month and such statement shall be accompanied by supporting invoices or bills paid if considered necessary. In addition to direct charges, unit operator is allowed a reasonable overhead charge.

9. Comply with Workmen's Compensation Laws and carry such insurance as may be required by the Operating Committee.

10. Make all monetary expenditures for operations and maintenance that is within his authority. This is usually between $5000 and $20,000 depending on the type of operation.

Operating Committee. The operating committee is the agent for the parties in the unit and has the general over-all management and control of the unit. It conducts the business affairs of the unit and is empowered to set and carry out the operating policies.

Each party within the unit who is represented on the operating committee usually has a vote equal to his proportionate share of the unit.

The operating committee acts upon the recommendation of the unit operator. It is the practice of most operating committees to have advisory committees to guide them such as an engineering committee, accounting committee, legal committee, and land committee. These committees may be of a permanent nature or reserved from time to time to handle special problems. In the case of secondary recovery operations, an advisory engineering committee usually functions to help maintain the reservoir information on a current basis and meet the multiple problems of an engineering nature which are likely to arise. At times, the operating committee may hire consultants to advise them if their own staffs are unavailable for a particular job.

The operating committee is the final authority and has the power to change the unit operator on proper showing of cause. In all matters requiring approval or a decision of the operators, each operator has a fractional voting power equal to his total participation factor and a simple majority is final.

Accounting Procedure. A uniform method of accounting for units is very desirable. After considerable study by the Mid-Continent Oil and Gas Association, an accounting procedure was developed which is almost standard in all unit agreements.

Development and operating charges usually are based on invoices received for work done and there is little chance of difficulty arising as to pricing. In the case where the unit operator or the non-unit operators furnish second hand equipment it is necessary to classify the equipment carefully as to grade and quality before deciding on the proper price. The same applies to disposal of lease equipment and materials. Final recommendations of the accounting committee are always approved by the operating committee.

—**The End.**

ACKNOWLEDGMENT

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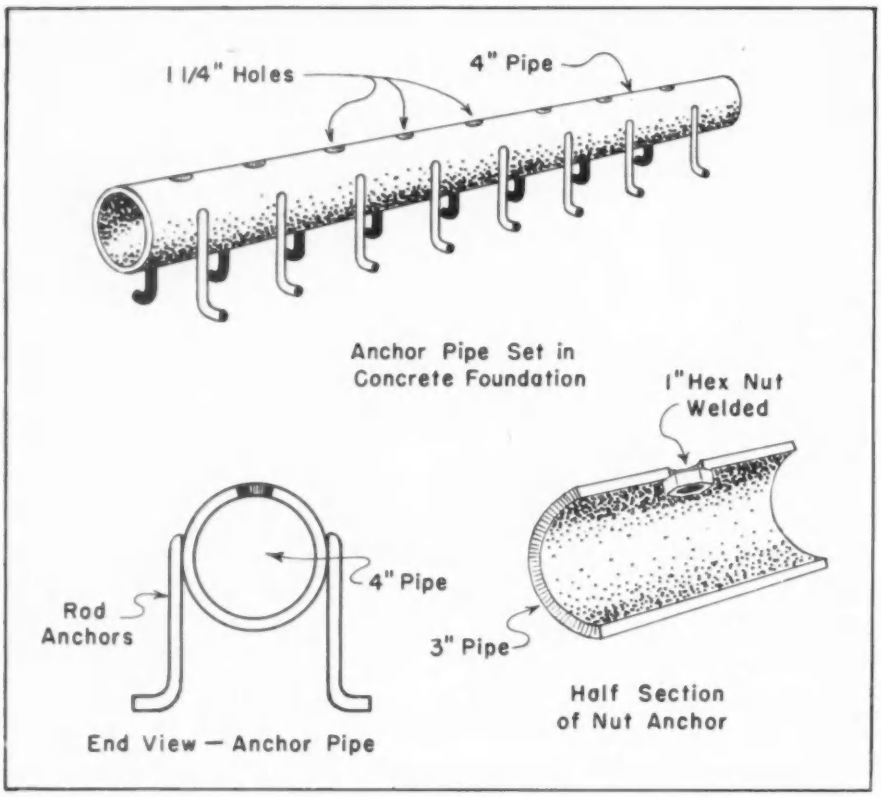

HERE'S HOW TO MAKE A MONEY-SAVER . . . .

Foundation Anchor Device Fits Many Sizes of Pumping Units

It's easy to build, sturdy and can be used for the life of the well.

SAVINGS IN PUMPING unit foundation costs and well downtime can be realized throughout the life of a producing well by installing a foundation and unit anchor device that fits many sizes of pumping units. Experience has shown that during the productive life of oil wells, it has been necessary to change pumping units several times. The original unit placed on the well might have been a relatively large one to handle fluids during the most productive period of the well. As production declined, it is many times necessary because of economics to install a smaller unit. The reverse may be true as well. In a near-depleted field where a water flood has been started, larger pumping units must be installed to handle the larger volumes of fluid produced.

Coping with these and many other conditions is a universal type pumping unit anchor that is simple to construct, is sturdy, and will serve throughout the life of the field. This type anchor device makes it possible to use only one pumping unit foundation for the life of the well. It consists of a section of four-inch pipe, the length of which may vary from 15 to 20 feet. Short legs about 18 inches long are made of sucker rod material that has been bent at the bottom to form feet and welded to the four-inch pipe as shown. These legs are added

ANCHOR DEVICE INSTALLED

at 18 to 20-inch intervals. One and one-quarter-inch holes are cut on 12-inch centers in the top side of this four-inch anchor pipe. This member, buried in the concrete foundation so that the top of the pipe is flush with the top of the concrete slab, is placed in the middle of the slab and parallel to the long sides.

Most pumping units are mounted on skids so that a cross bar spanning the skid beams can be bolted to this four-inch anchor pipe to hold the unit firmly in place. A short piece of three-inch pipe contains a hexagonal one-inch nut welded inside of the short pipe. A hole slightly larger than the nut opening allows the bolt to be threaded through the pipe and screwed into the nut. This nut carriage can be inserted inside the four-inch anchor pipe by means of another piece of smaller pipe. It is pushed inside the anchor pipe until the nut carriage is immediately under the opening in the anchor pipe where the anchor bolt will be inserted.

The anchor bolt holds down a cross bar that spans the skid beams of the pumping unit. If the unit is small, only two anchor bolts are required; one in front and one placed at the rear of the unit. Other bolts may be used if the unit is larger and requires more anchorage. Should another unit be placed on the same foundation, it is only necessary to loosen the anchor bolts, move the unit off and spot the second unit in place. It may be necessary only to respace the nut carriages so that the anchor bolts can be conveniently spaced.

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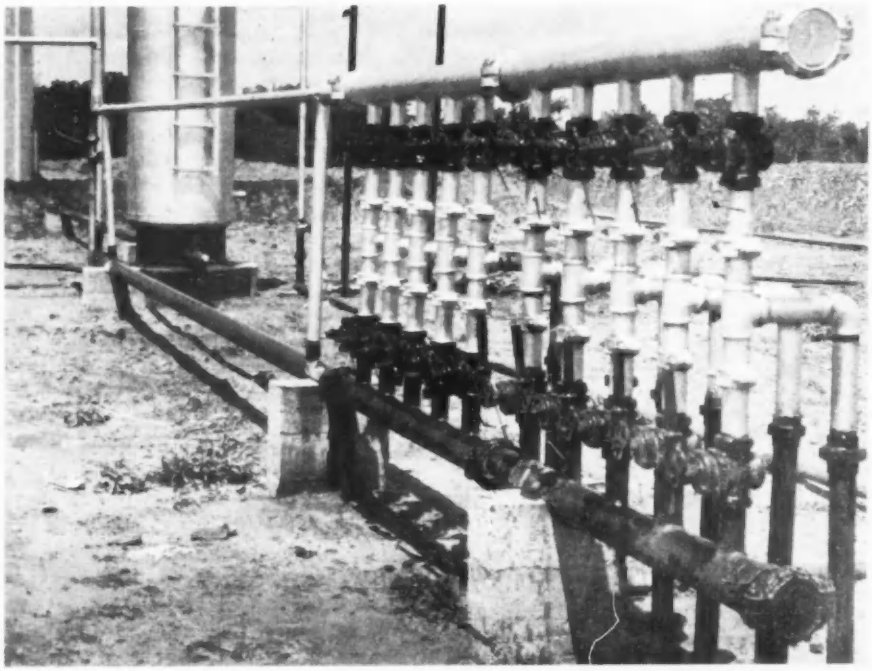


Making Vertical Flow Line Manifold

Make a unique flow line header that is compact yet includes many time-saving features. It's designed to allow any changes that may be needed. Fewer fittings are required. As in most flow line manifolds, this one is designed so that the flow of oil and gas from any one well can be diverted into the lease separator or a test unit. Each line comes into the manifold and connects to a line that ties into both the test separator header and the lease separator header. A valve is placed on either side of the incoming tie-in to control the flow of oil and gas.

The flow lines from each well are of two-inch pipe, as is the tie-in lines to each header. Both headers are of four-inch pipe. The bottom header ties into the lease separator, which is supported on concrete pillars in order to place the valves in the manifold at a convenient height. Since the control valves for any one well are located one above the other, it is easy for the pumper to determine quickly and surely into which header the oil is flowing. Quick-making couplings are used throughout to facilitate construction and any future changes. Ends of each header are blanked off with similar couplings so that adding on to them will be a simple task.

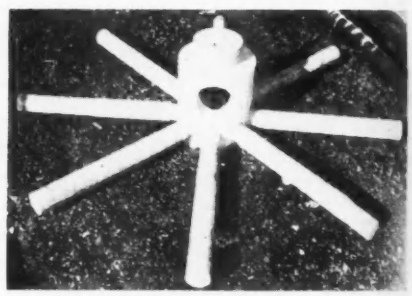
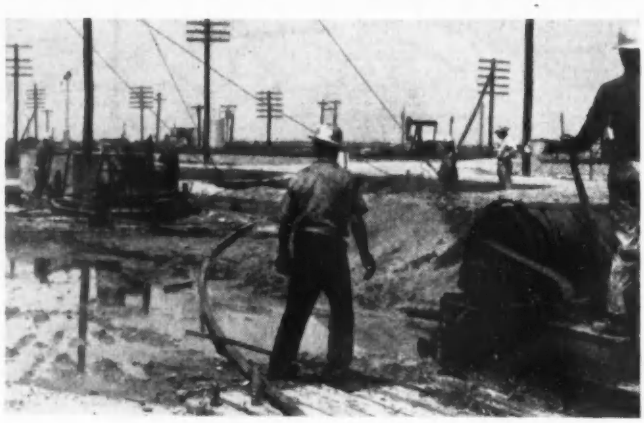


Photo Courtesy East Texas Salt Water Disposal Co.

Skidding Mud Tank With Sand Line Unit



The sand line unit, when not truck mounted, not only can be used in regular well service operations, but as shown here in skidding a mud tank into position near the mud pump skid.

Although some 75 feet from the well on which a portable workover rig was set, this sand line was tied to the mud tanks through a pulley connected to the mud pump skid. In short order, the tank, which normally might have required the services of a boom truck, was placed exactly where it was needed.

When doing a job such as this, extreme caution must be taken to keep members of the crew in the clear should the wire rope break.

Draining Filter Tank

A drain system for a 96-inch diameter pressure filter which conditions salt water at a central disposal plant was made from asbestos-cement corrosion-resistant material. The eight three-inch spokes end at a thick-walled hub. The opening to the hub is threaded to receive a six-inch pipe. The lateral arms are fabricated of three-inch asbestos-cement pipes that are perforated with one-half-inch holes on the bottom, placed so as to deliver approximately the same volume of water to every square foot of filter area. The lateral arms will be covered by coarse gravel and then progressively by layers of smaller gravel and finally by the filter sand.

HINTS . . .

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Fumes and smoke emanating from oxy-acetylene or electric arc welding can be discharged from the immediate vicinity of the welder by a shop-made device known as an exhauster. Made from a salvaged steel drum, an electric motor and fan blade, the exhauster is mounted on an adjustable stand so that it can be directed away from the work at any desired angle.

Mount the electric motor inside the middle of the steel drum on four-way brackets welded to the inside of the drum walls. Pass the electric cord through a hole cut in the bottom of the drum to supply the motor with electricity.

Attach three legs to the drum along a longitudinal axis at the bottom and weld three sets of metal tabs to the drum so that each leg is attached by short bolts. The center leg, a telescoping section of pipe, can be locked in any desired position. The outer legs serve as stabilizers. So long as piece work is being welded on the welder's bench, the exhauster can be set up as shown and seldom moved or its position changed. Small items such as valves and fittings and frames can be welded on the table with freedom of objectionable fumes and smoke.

Diverting Oil Flow

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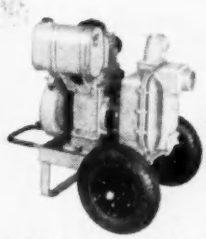

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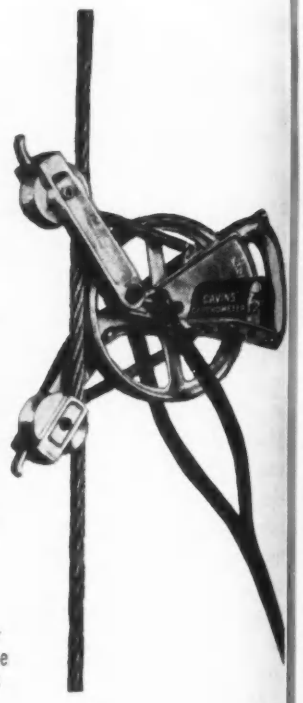

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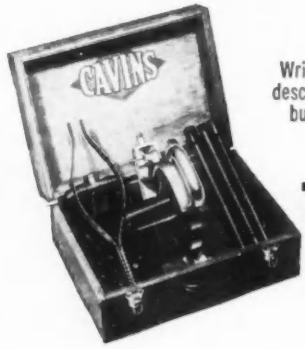

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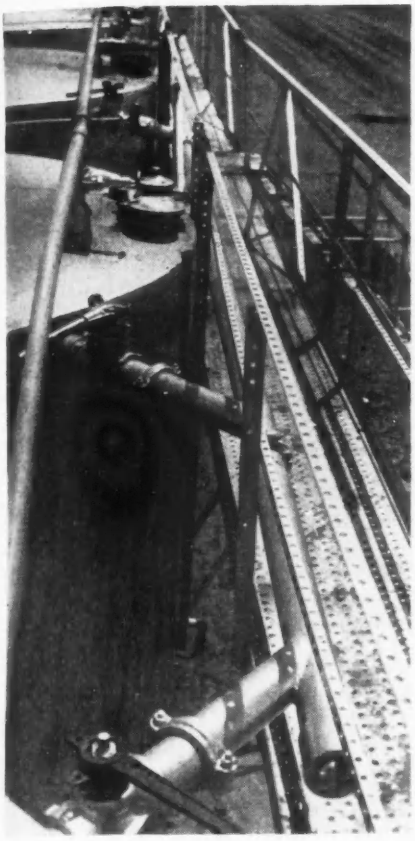
Prove it to yourself. Send for a free sample. Crane Packing Company, 1817 Cuyler Avenue, Chicago 13, Ill.

JOHN CRANE CRANE PACKING COMPANY



on remote leases and may not receive proper attention. So it is desirable to be able to control the overflow from one tank into any other tank. Should one tank contain oil that needs to be treated before pumping into the pipe line gathering system, it is necessary to blank out this tank until it is conditioned to pipe line specifications.

This tank overflow system is made from four-inch pipe attached to all-welded stock tanks so that the entrance line connects into the header at an angle. This angle connection provides the necessary length in which a valve can be added. The line is fabricated with quick-make couplings so it can be installed or dismantled quickly.

To blank out one particular tank, it is only necessary to close off the fill line valve and close the overflow valve. Should a tank being filled overflow, it will not overflow into this isolated tank. The overflow oil will pass onto the next tank which will then fill until the pumper has an opportunity to inspect the battery.

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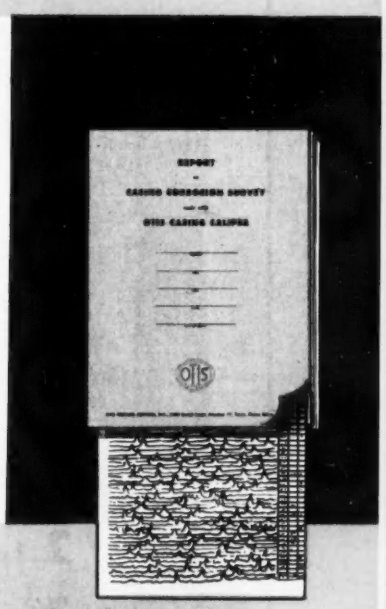

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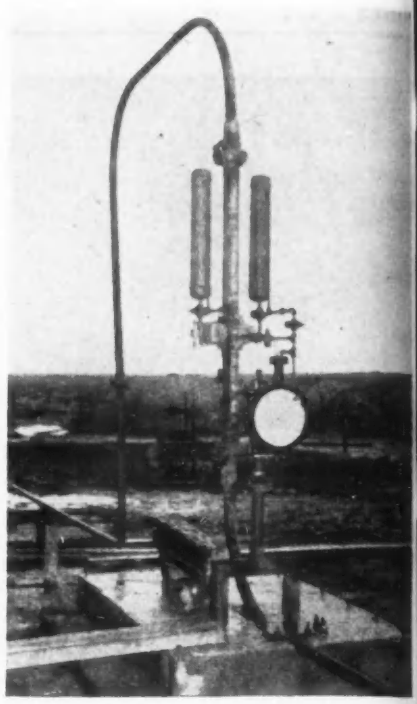
HINTS . . .

Measuring Gas

Measure the gas gathered at wells by a vertical meter run made by using three single-bolt unions and four right-angle bends. Place one union just above the orifice flange, one on the riser on the upstream side, and one on the riser on the downstream side. Assemble the orifice flange between the two unions on the second riser and make the proper bends in the pipe.

As soon as the orifice flange and the pipe is in place as shown, pour a concrete block around the meter run for the meter house. Where the pipe turns toward the main line, pour the concrete around the pipe and set bolts in the cement so that a plate can be bolted down to keep the pipe from moving under expansion and contraction on the downstream side.

Weld a U-bend of four-inch pipe to the plate to support the recording gauge of the meter hookup. Attach the recorder through a two-inch flange so that it can be easily taken loose for repairs. The connections to the orifice flange are made through long pots made from four-inch nipples



with dished ends welded to each end. Any condensate that does not pour right through the orifice falls out in the pots and returns to the meter run.

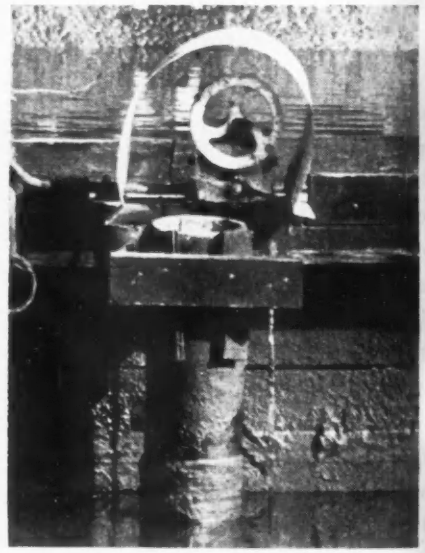
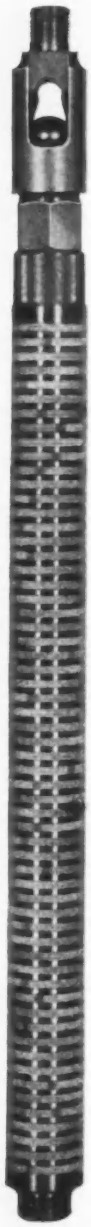


Photo Courtesy East Texas Salt Water Disposal Co.

Controlling Water Level

Control the water level in a central salt water collection pit at a disposal plant by an electric switch which actuates the centrifugal filling pump. Should the water level rise to a predetermined point, the switch energizes a breaker switch that stops the electric motor driving the filling pump. When the water level drops below this point, the pump is started again.

The mechanism consists of a small sheave mounted on one of the collection pit partitions. Connect the shaft



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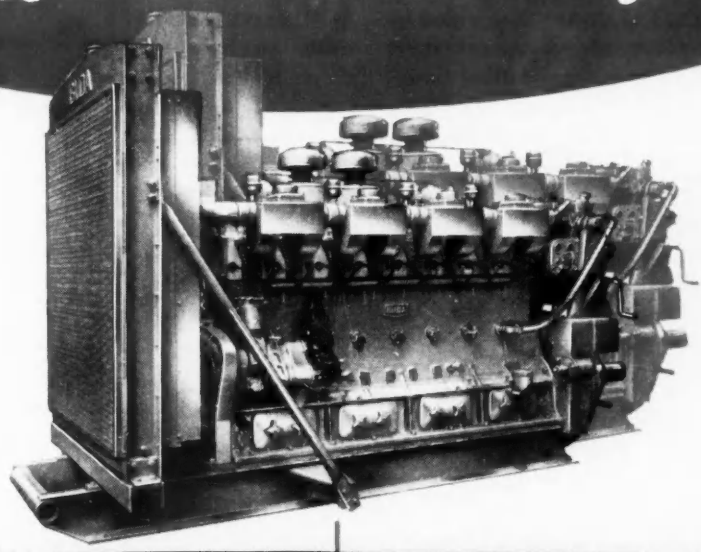

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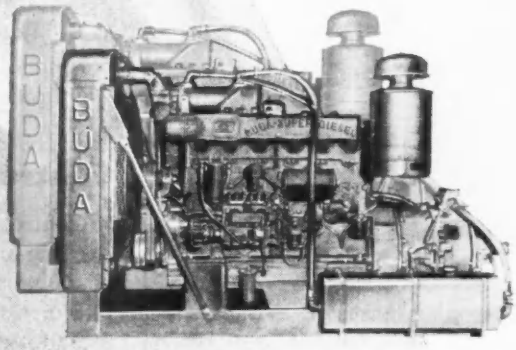
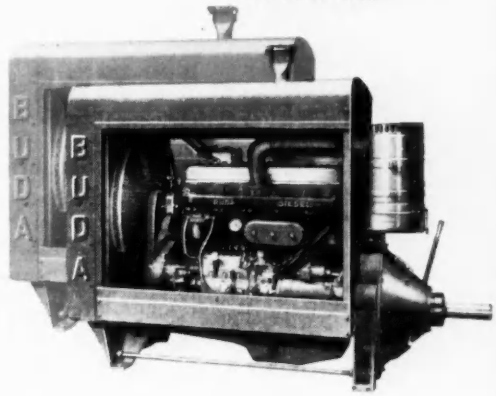


Torque Converter Power Package with High Speed Diesel or Gas Engines

High Speed Engines Diesel or Gas



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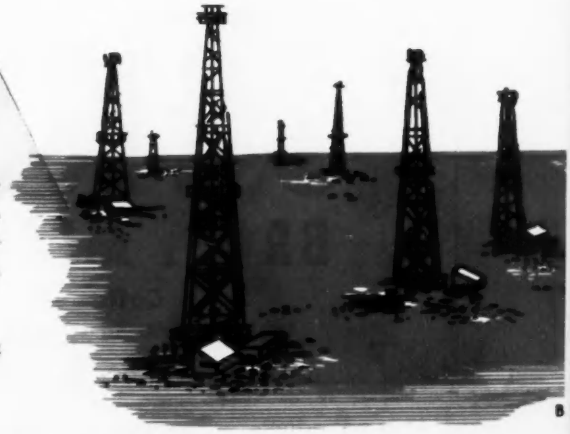

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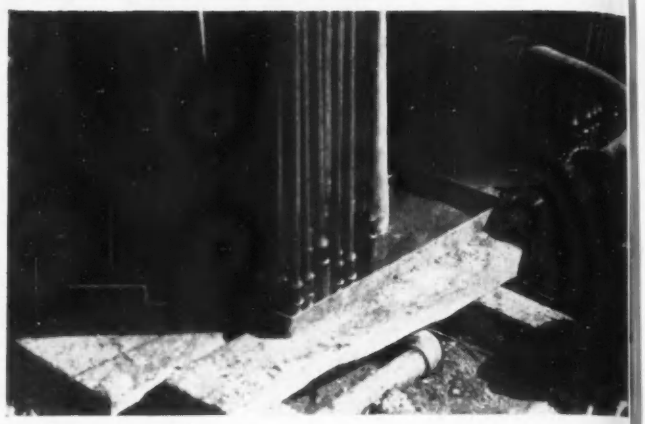
of this sheave to an electric connector and attach a flexible wire to a ceramic float on one side of the sheave, then thread it over the sheave and attach it to a weight on the other side.

To prevent wave action in the collection pit from causing the switch to be energized falsely, enclose the ceramic float in a vertical section of cement-asbestos pipe supported at top and bottom. The sheave is shielded by a curved piece of galvanized sheet metal to protect it from falling limbs, leaves, etc.

Racking Sucker Rod Stands



When sucker rod stands are set back on the mat when pulled from the well, they can be racked easier, and pin ends kept cleaner if shallow steel pans are used as illustrated. By using such pans, there is less likelihood of a stand skidding to one side and perhaps causing other stands to shift or fall. The pans are made of ten-gauge steel and measure approximately 12 by 30 inches. Each pan has a two-inch flange turned up around all sides. Two pans were used on the well shown but the size and number of pans used can be dictated by the depth of the well or wells being serviced.

To create a softer and more nonskid surface on which the rods stand, the bottoms of the pans can be lined with sections of salvaged canvas belting. Grit from wind-blown sand or debris on pin ends is reduced with the present system because the flanges are high enough to shield the threaded portion of the pin, thus saving time when rods are rerun in the well.

Centralizing Controls

Controls of this lightweight workover rig are centralized at the left rear of the unit where a unique detachable platform is located. Complete with foot throttle and all, this stand supports the unit operator well off the ground level to provide him with full vision around the well head. Clutches for both the drawworks and a rotary drive take-off as well as the drawworks brake are within easy reach of the operator.

The platform on which the operator stands when the unit is in use is made by welding two parallel pieces of three-inch pipe about eight inches apart to the underside of the truck frame. The platform is made from a piece of one-half-inch foot plate measuring about 28 inches by 19 inches. Rounded corners eliminate hazardous sharp edges. The platform is supported by two legs: one vertical, the other welded at an angle. Two short nipples are welded

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at right angles at the tops of the legs which are made of two and one-half-inch pipe that fits snugly inside the three-inch nipples welded to the truck bed.

The foot throttle, made of similar sheet steel and shaped to a convenient size, is bolted loosely to the platform and the other end attached to a piece of chain linked to a hinged element that changes the direction of pull 90 degrees. Since the throttle is spring-loaded to return the engine to idling, the driller easily can control the engine sped with the touch of his right foot.

The platform and throttle control are easily detached and loaded on the truck bed for moving.

Want to earn some money?

• Share your ideas for a better way to do or make something. Send a picture illustrating your idea with a written description to The Editor, WORLD OIL, P. O. Box 2608, Houston 1, Texas.

H-F "FLEXITE" Rod Pumps for WATER • HEAT • CORROSION

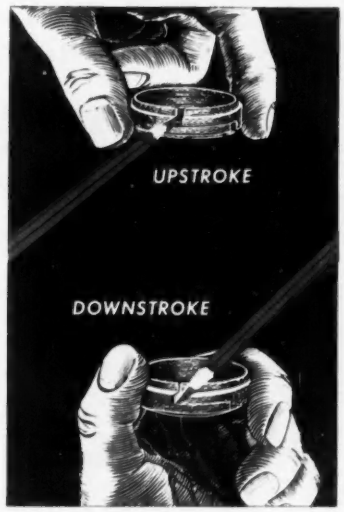
Flexite Rod Pumps run good in any tough well because of the dependable, trouble-free performance of the plunger. They are especially efficient in wells making a high percentage of water, hot salt water brine, or for pumping high-sulphur crude. Unlike ordinary plungers with soft ring packing, Flexite Rings are precision ground for an exact fit in the barrel tube. They are made of a hard, tough plastic composition impregnated with graphite. They are self-lubricating, will not swell or corrode, and do not require soaking or fitting before running.

Flexite Rod Pumps are available in a full range of A.P.I. types with plungers from 20- to 60-ring lengths and longer for various depths and fluid loads. Pumps can be furnished with heat-treated or chrome-plated barrel tubes for extra long wear; for corrosive conditions, pumps with all parts made of either corrosion-resistant stainless steel or Monel are available.

If your wells are hard to pump, run a Flexite Rod Pump – it will be easier on your power unit and rods, and you'll like the long service you'll get. Ask your supply store.

"FLEXITE" Plunger Rings

The sealing action of Flexite Plungers is obtained by a built-in inner tension in the step-cut rings. This allows them to expand to a tight fit against the barrel tube wall without presizing, soaking, etc. The rings expand to an even tighter seal under pressure of the fluid load, but release upon reversal of the plunger stroke.



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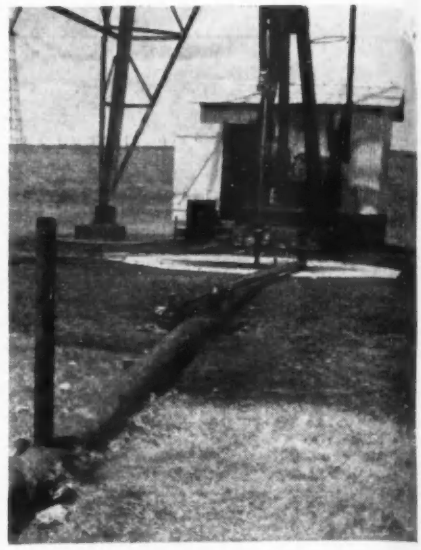
HINTS . . .

Heating Flow Line

Build a small "on-the-line" heater from salvaged eight-inch casing to prevent the deposition of paraffin inside the flow line from the well to the tank battery. During winter, spring and fall months, a North Texas lease experienced some paraffin trouble in the flow lines, but not enough to warrant a full-size heater. Enough heat to keep the paraffin in solution was provided by a field-made heater that utilizes fuel gas from the pumping engine.



Length of this type heater may vary, depending upon the length of casing available. Here it is about 15 feet long, and surrounds a three-inch flow line which was laid on the surface for a short distance. Annulus between the three-inch flow line and the casing was closed off by a piece of thin sheet metal cut to fit, but not welded. The short three-foot smoke stack was welded into the casing as shown.

One-inch pipe brings the low-pressure fuel gas to the opposite end of this heater where a short section of copper tubing carries the flame well into the annulus. Rising heat from the stack draws in air at the burner end so that just enough heat is created around the flow line to keep the paraffin in solution. The three-inch flow line provides greater heating surface. This has been a trouble-free installation, and many such wells in the field are so equipped. A valve at the burner controls the size of the flame which is shielded from the wind by a sheet metal wind breaker that fits over the flow line.

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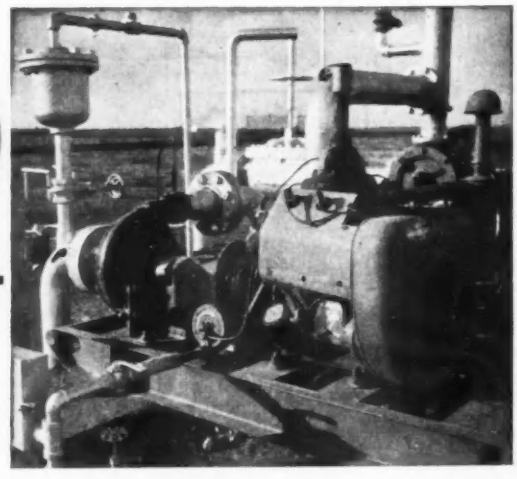
Power TO FIT THE JOB

Power TO FIT THE MACHINE

WISCONSIN-POWERED BOOSTER PUMP



Here, a Goulds centrifugal pump boosts oil into a positive displacement pump on a field transportation system. A Wisconsin Heavy-Duty Air-Cooled Engine drives it . . . assurance that high pressure pumps *are always "flooded"*, preventing damage if they stop or lose capacity.

Solution of your own power problem probably lies in specifying a Wisconsin Air-Cooled Engine. Each Wisconsin offers the widest margin of usable power, *delivering* and *holding* the horsepower shown on the curves. And such features as tapered roller bearings at both ends of the shaft, taking up all thrusts, fool-proof air-cooling and unmatched ruggedness overall, produce the kind of power that makes *light* of *heavy work* wherever it's found.

4-cycle single-cylinder, 2-cylinder and V-type 4-cylinder models, 3 to 36 hp.

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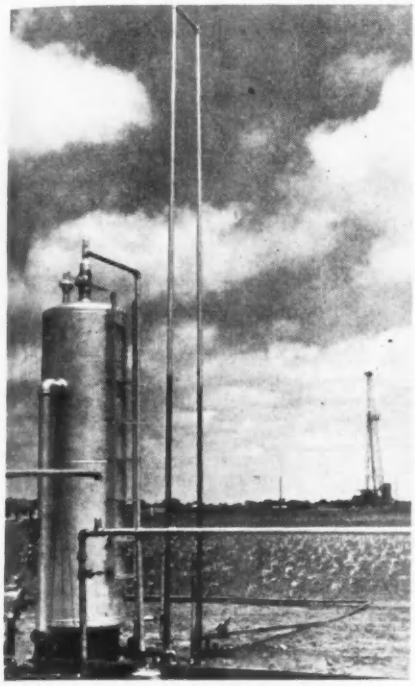

Keeping Fuel Gas Dry

Keep fuel gas dry with this high overflow leg. It virtually prevents any liquids from flowing into the flue line should the separator fail to dump. Condensate or light oil can be dangerous when entrained in the gas used as fuel on drilling rigs. Wherever such connections are made at a tank battery, every precaution should be made to keep liquids out of the fuel line.

When only one separator is used, it is essential to guard against possible failure of any part of the separator. However, should the dump valve fail to function, oil will carry over into the fuel line unless precaution is taken. Install this high overflow leg on the downstream side of the separator gas line, equip the separator with a weight-loaded pop valve, and equip the gas flare line with a weight-loaded back-pressure valve.

Should the separator dump valve stick and the separator fill with oil, the overflow will be carried out the gas vent line on top of the separator and fill the gas line. However, the oil will fill one of the high legs on the overflow line up to a certain point where the back-pressure valve on the flare line opens to discharge the oil. This back-pressure valve is set to open when the hydrostatic head in the overflow leg reaches a predetermined point.

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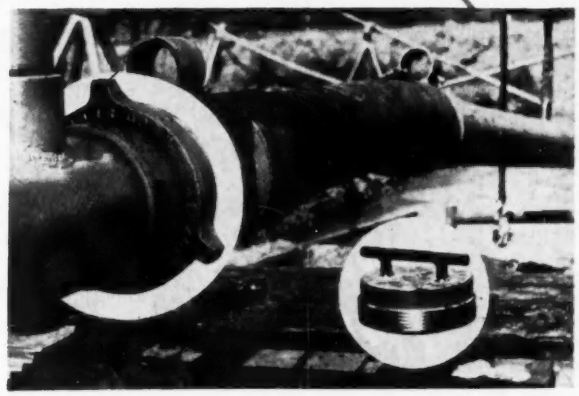
• WECO Fig. 400 union on pump suction line. Blanking plug, foreground, simplifies compounding.



Selected Raw Materials

• Quality in WECO Unions starts with the forgings or castings which are produced according to our own critical specifications. These are obtained from sources best qualified to meet our exacting requirements.

WECO Unions from Fig. 200 through Fig. 1502 are steel forgings or steel castings. The WECO Fig. 100 Union (1,000 psi Test) is made of highest quality certified malleable iron.

What does this mean to you? It means that WECO Unions are stronger, tougher, more durable . . . will withstand more use and abuse. It means you're sure of longer life and perfect sealing, even in the toughest oil country service.

Whether you need a high or low pressure union, you can trust WECO's for maximum service and perfect sealing.

Ask your Supply Store for the WECO Union you need. There's a size and pressure to meet every oil industry requirement.

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Improved design and longer operating life *lower* the cost of labor per barrel, *lower* the cost of maintenance per barrel, *lower* the investment cost per barrel, *lower* the cost of fluid per barrel.

Also the ability of Reda pumps to produce greater volumes in limited casing sizes and from greater depths often reduces the number of source water wells required.

Reda engineers have long been associated with water flooding operations and are fully qualified to assist operators in discussing their source water requirements.

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PUMP COMPANY
BARTLESVILLE, OKLA.

HINTS . . .

Rigging Extension Exhaust

An extension exhaust pipe and muffler unit combining safety with ease in rigging and handling can be contained in the assembly used on a pulling unit. It is used when free gas and/or oil spray from the open well may make working conditions hazardous due to the possibility of ignition by the engine exhaust.

The unit consists of two joints of light wall pipe equipped with quick connecting couplings, terminating on the far end with an enlarged chamber made from a section of casing. To speed rigging-up of the device at each location, or facilitate moving whenever a change in the prevailing wind makes shifting advisable, equip the muffler with a sturdy handle, so that the unit can be carried by a man as he would carry a suitcase. A short length of channel iron welded to the bottom of the muffler forms a flat base which facilitates positioning the unit on the ground each time it is moved.

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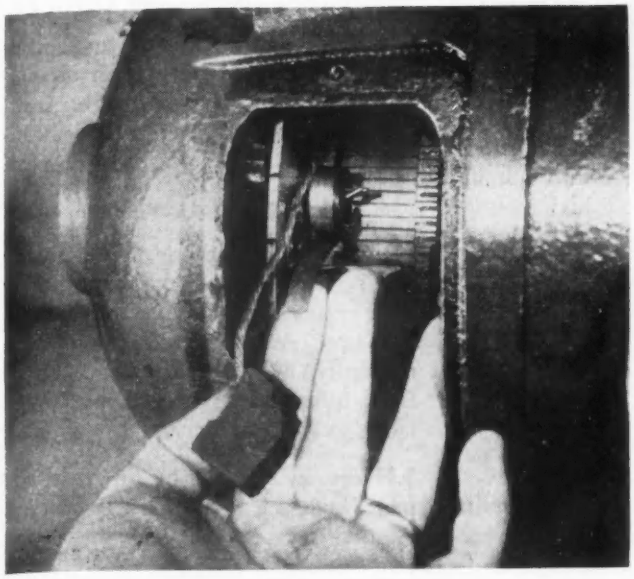
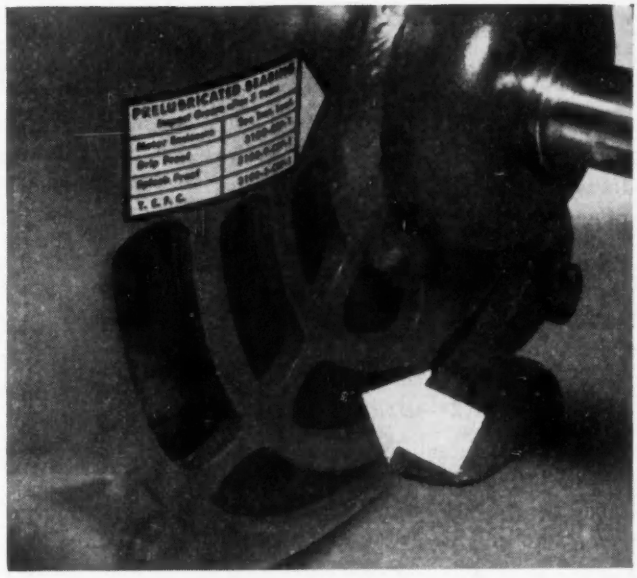


1. Inspect brushes and commutators.



2. Keep motor ventilation openings clean.

3. Contacts worn through by long use or badly burned contacts must be renewed. Surfaces against which contacts are bolted should be cleaned. Clean copper contacts, though slightly roughened, are satisfactory.

4. The working parts of dashpots are machined to small clearances. They should be kept clean. Parts should move freely without friction. Correct oil should be used and oil level should be correct.

How to Maintain Electrical Equipment

. . . these 25 basic rules will pay off with prolonged service.

By H. R. MEYER, Manager Maintenance Department
Westinghouse Electric Corporation, East Pittsburgh, Penn.

ELECTRICAL EQUIPMENT, like all other types of equipment used by the oil industry, is generally expensive and sometimes hard to get. It is, therefore, good business for the operator to maintain it in the best condition possible and utilize every ounce of service that it is capable of giving. Regular inspection of such equipment will reduce repair time, and instructions to field personnel on how and when to check and maintain motors, control equipment, wiring, transformers, etc., will result in definite savings.

To help field personnel keep electrical equipment in top condition, the following check points are presented. These checks are recommended

wherever electrical equipment is in use.

Motors

1. Keep the windings, ventilating ducts, commutators and brush rigging clean.

In dusty locations, blow out weekly; under severe conditions, daily. Do not use air pressure higher than 50 pounds.

2. Lubricate regularly, carefully.

Follow manufacturer's instructions. Oil *daily* those motors that require it. Schedule definite oiling dates for the others. In dusty or damp locations, drain oil once a month and renew. Do not over-lubricate. It wastes oil, gets in windings and deteriorates insulation.

3. Examine bearings.

Check daily on heavily used motors; once a week on others. Check oil ring. Feel high temperatures. Check for excessive end play.

4. Check air gap between the rotor and stator.

Check weekly on motors that operate with excessive belt tension; others, once a month. Differences in width of gap indicate bearing wear which, once started, accelerates rapidly.

5. Inspect brushes and commutators.

Check daily on those motors in severe service; others once a week. Keep commutators smooth, with brushes seated perfectly. On carbon brushes use correct grade to prevent excessive commutator wear and control arcing.

6. Inspect all exposed motor leads.

Check weekly. Keep connections tight, free from oil and moisture, well insulated and protected.

7. Inspect ground connections.

Check weekly. Keep tight and in good condition. These are important to safety of employes and, in some cases, of current protective devices.

Control Equipment

(Includes magnetic switches, air and oil circuit breakers, controllers, compensators, etc.)

1. Keep control equipment clean.

Once a week, clean and blow out dirt and dust from starting switches, compensators and air circuit breakers. Under unusually clean conditions, clean out quarterly or semi-annually. Keep dirt and dust off high voltage bushings and terminals.

2. Keep contacts smooth.

Inspect heavily used equipment weekly; others once a month. File burned contacts smooth or replace. *Do not lubricate contact surfaces.*

3. Replace worn parts.

Under severe conditions examine all equipment monthly and replace all worn or burned parts; under normal conditions semi-annually. Keep adjustments correct.

4. Keep electrical and mechanical connections tight.

Once a week inspect parts that vibrate. Look for loose connections, missing or loose nuts and broken mechanical parts.

5. Keep oil at proper level and in good condition.

Under severe conditions or in dirty or damp locations, make a monthly check of oil condition and oil level. Replace dirty or gummy oil. Keep level up to indicator.

6. Check overload devices.

Circuit breaker tripping points should be checked monthly. Replace dashpot oil if thick and gummy. Keep orifices in plunger clear. Keep leather bellows soft and pliable with neat's-foot oil. Be sure that heater coils for thermal overload relays are correct size. Check overload relay settings every six months.

Lightning Arresters

1. Maintain ground connections.

Inspect in early spring before the start of the lightning season. Check the condition and resistance of ground connections. Resistance should not be over 5 ohms. *Never run ground wire through iron or steel pipe unless wire and pipe are bound together.*

Wiring

1. Keep wiring in safe condition.

Examine monthly where vibration exists. Keep lock nuts and bushings tight on conduit, cables and other raceways. Protect wire from oil and water. Keep open wiring tight, insulated and safe from mechanical injury. Inspect all wiring once a year.

2. Check extensions and drop cords.

Examine every three months where use is heavy. Check closely where wire enters socket, plug, switch, etc. Replace or repair excess wear promptly. Keep drop cords away from nails, metal hooks, etc. Keep lamp guards in place.

3. Keep switch, junction, fuse and panel boxes clean and tightly covered.

In dusty locations clean out weekly. Keep covers and unused "knockout" plugs in place. Inspect monthly.

Fuses

1. Check size.

Twice a year inspect all fuses to determine that circuits are not overfused.

2. Keep fuse clips clean and tight.

Check connections to prevent overheating and breakdown.

3. Maintain refillable type fuses.

Replace charred casings. Keep fuse assembly tight. Refill with links at the same rating as the casing.

4. Keep fuse and switch cabinets tight.

Prevent escaping sparks when fuses blow by plugging unused knockouts. Always keep doors tightly closed and secured.

Transformers

1. Keep oil in good condition.

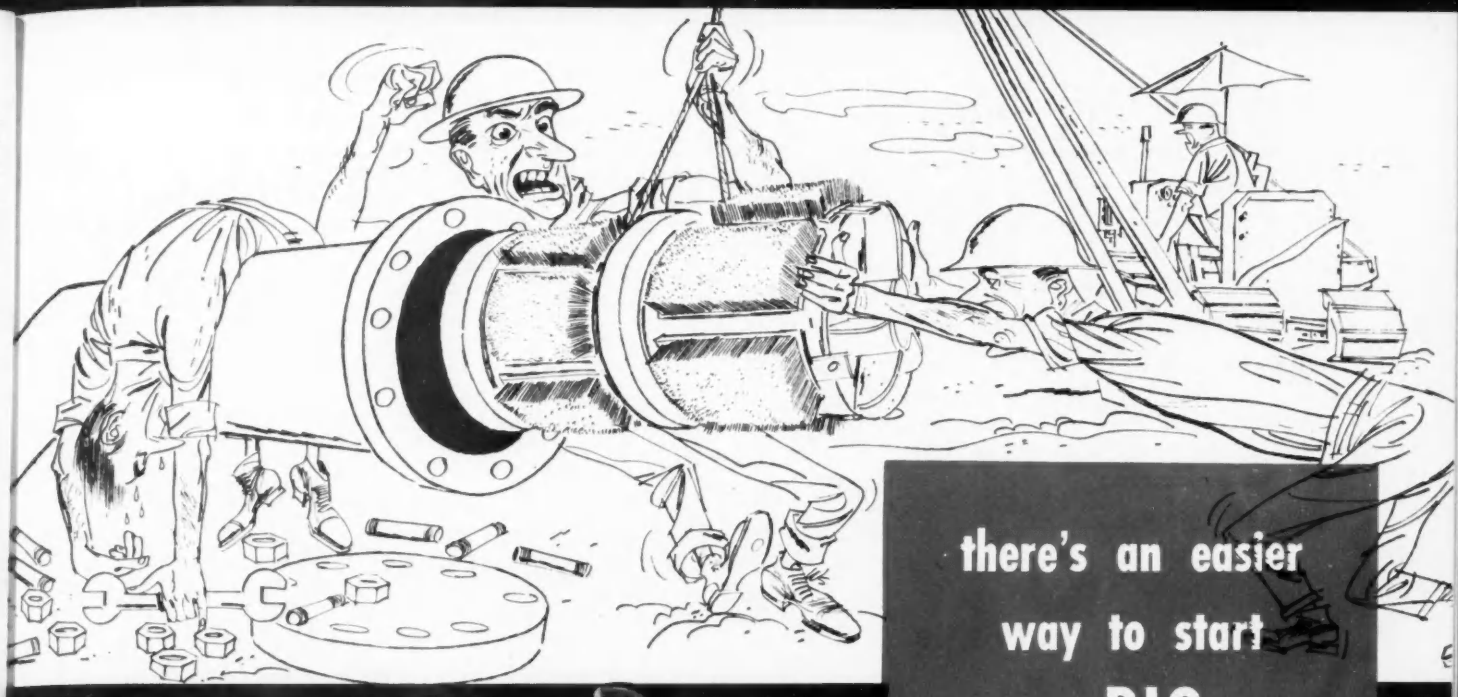
Test annually to determine dielectric strength. If less than 18 kilovolts in standard tester, recondition oil.

2. Maintain oil at proper level.

Check oil level every three months. Replace leakage and evaporation loss promptly.

3. Prevent excessive temperatures.

Test operating temperature of fully loaded transformer once a month. Temperature should never exceed 90° C.



there's an easier way to start a PIG

UNIBOLT scraper trap

with oversize barrel

makes line pressure do the hard work!

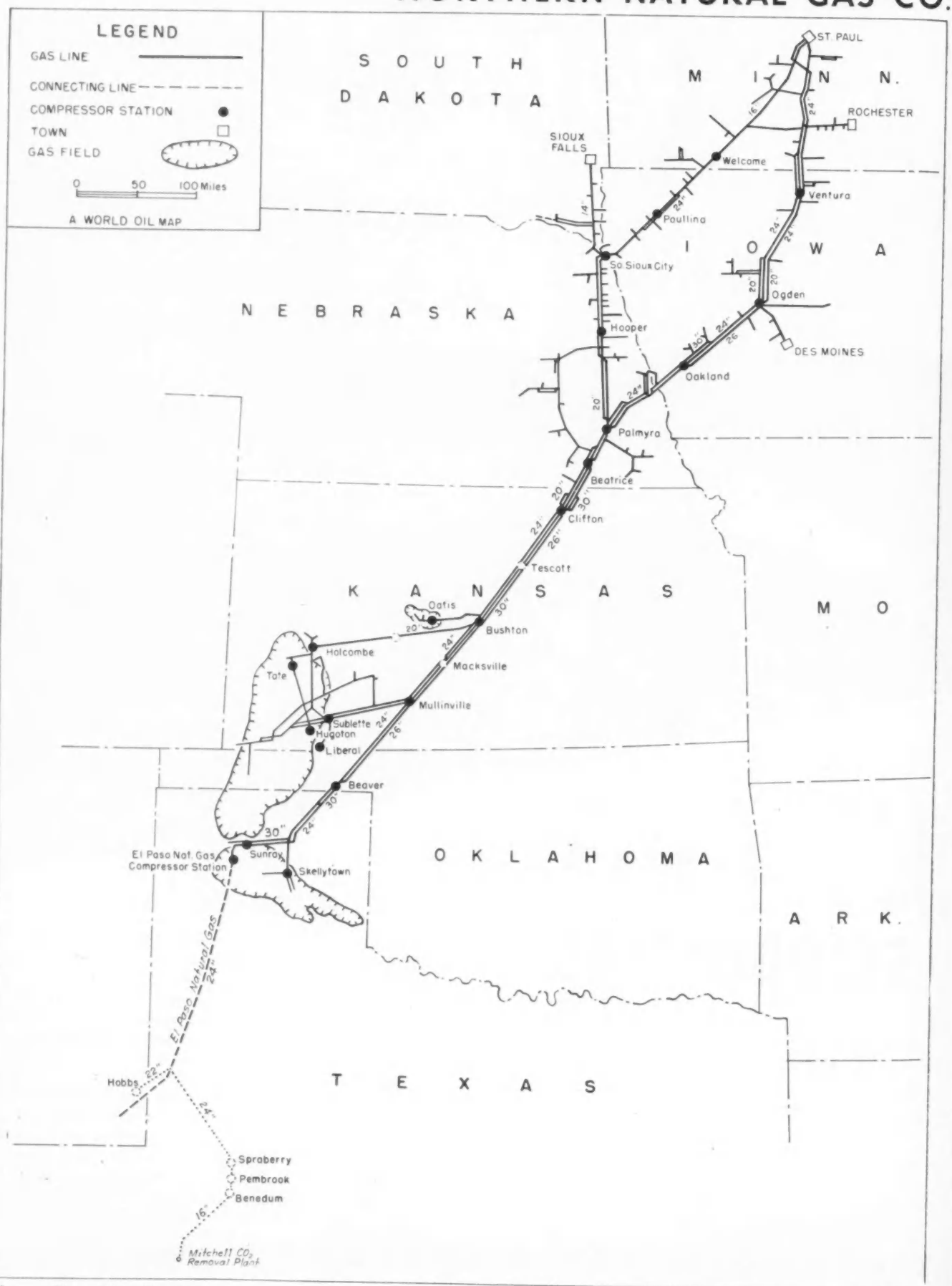
An oversize barrel on the sending and receiving ends of a line, slightly larger than the diameter of the pig, makes it easy to send or catch a scraper. Line pressure does the heavy work. But to make the job doubly simple and easy, you need UNIBOLT Hinged Scraper Traps. To open them, all you need do is release two bolts and the blanking plug swings open like a door. No heavy lifting. Nothing to fall on workmen. No time-consuming blind flanges to break out and make up. No danger of leaks. A self-sealing resilient ring assures a pressure-tight closure.

Wherever multi-bolt flanged couplings and closures are now being used . . . on strainers, scrubbers, mist removers, terminal manifolds, blowdowns or other pressure vessels . . . UNIBOLT Couplings will serve you better.

THORNHILL-CRAVER COMPANY • P. O. BOX 1184 • HOUSTON, TEXAS

Map of the Month

NORTHERN NATURAL GAS CO.



. . . . a product of the depression days . . . that just grew and grew.

RISK CAPITAL during the depression! That's what brought Northern Natural Gas Company into the world on April 25, 1930. Remember, that was the day of the bread line.

It was also the day when the idea of moving natural gas long distances through large diameter steel pipe lines was almost fanciful. And yet—three companies raised the necessary money and nerve to give birth to one of the first of the modern long-distance gas transmission systems.

The three companies that provided the money for this unprecedented risk venture were: North American Light and Power Company, The United Light and Railways Company and Lone Star Gas Corporation. These companies have since disposed of their holdings and now Northern has better than 15,000 stockholders.

From the beginning, Northern Natural has never stopped growing. Today the company is in the biggest expansion program yet. One that will bring its delivery capacity to more than a billion cubic feet per day. But originally, it started as a 24-inch line running north from Clifton, Kans. (At that time Kansas Power and Light Company transported the gas across Kansas.) As the line was laid by Smith Construction Company, now known as C. S. Foreman, customers were tied in and deliveries commenced. The first customer was Beatrice, Neb., that hooked into the line on September 9, 1930, a scant four months after the company had been incorporated.

Other towns were hooked into the system as construction proceeded northward. In October 1931, Northern crossed into Minnesota with a 16-inch line and by 1934 had reached Minneapolis.

Today Northern has 7030 miles of pipe lines with a delivery capacity of 735 million cubic feet a day north of Clifton. But before the year is out, this capacity will have been increased to 1007 million by 30-inch loops and additional compressor horsepower. And 1954 will see delivery capacity climb to 1100 million cubic feet per day.

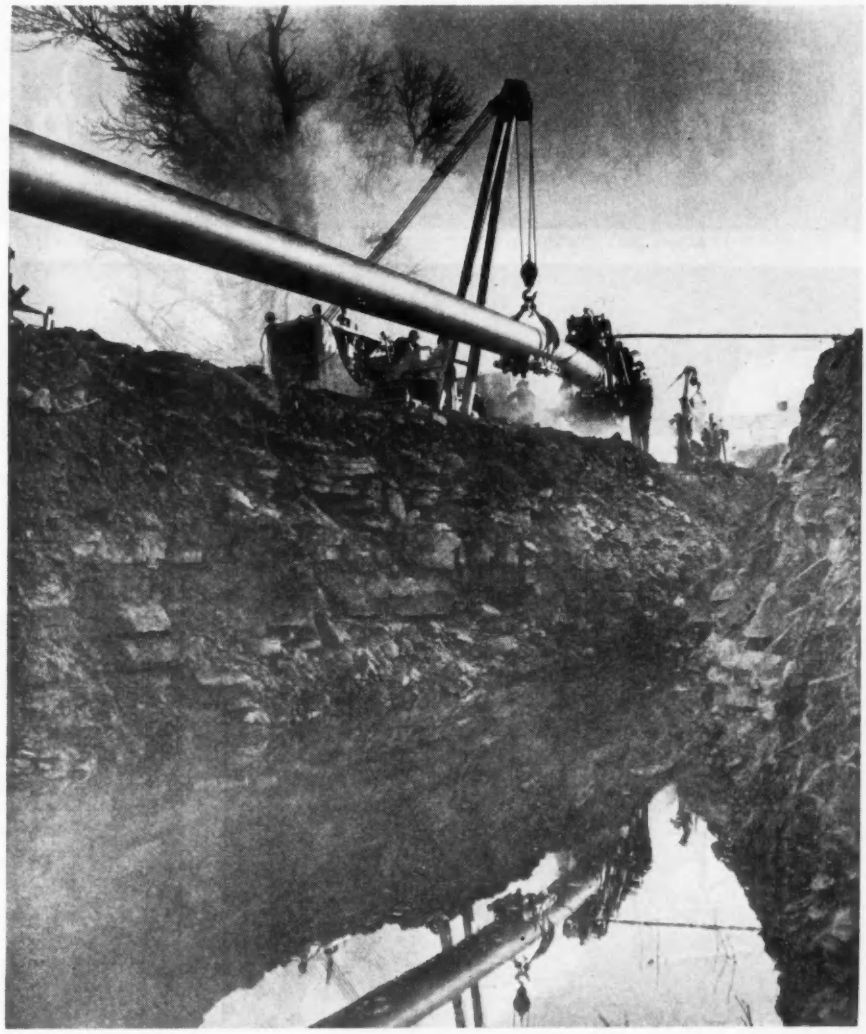
This new construction is actually two separate programs telescoped together. One program called for expansion to 825 million a day; the other to 1.1 billion. The green light for the latter came on May 1 when the FPC issued a certificate to Permian Basin Pipeline Company, El Paso Natural Gas Company and Northern Natural. It permits Permian to build its gathering system in New Mexico and West Texas to supply Northern and El Paso Natural with residue gas.

One of the interesting features of this program is that El Paso Natural will reverse the flow in a 203-mile-long 24-inch pipe line that runs between Dumas and Yoakum County, Texas. This will eliminate the situation of El Paso transporting gas south through one line and Northern carrying it north through a parallel line. Here's the way it works. Permian will deliver a minimum of 100 million and a maximum of 300 million cubic feet per day in the Permian basin area. In turn El Paso will deliver a like amount of gas at Dumas.

Northern Natural owns 55 percent of the stock in the Permian Gas Company.

When this big expansion is complete, Northern will have increased its capacity over 400 percent of what it was in 1944.

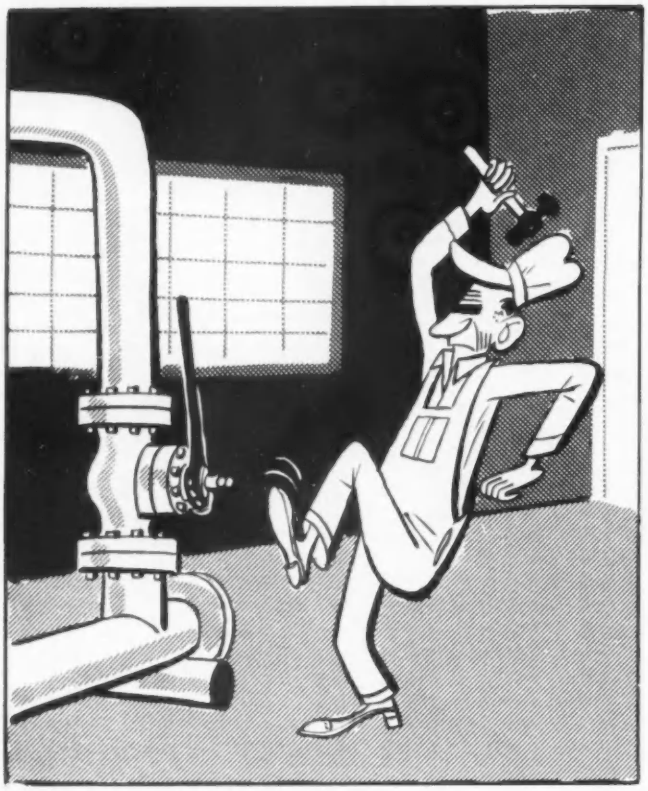
Officers of Northern are: J. F. Merriam, president; A. B. Dilworth, vice president and controller; P. A. Gass, vice president (personnel); J. M. Hanley, vice president (gas supply); R. L. Harrison, vice president and president of Peoples Division; J. T. Innis, vice president (operating); M. L. Mead, vice president; W. L. Shomaker, vice president (wholesale marketing, public relations); B. H. Harper, secretary; H. H. Siert, treasurer, and L. I. Shaw, general counsel.—**The End.**



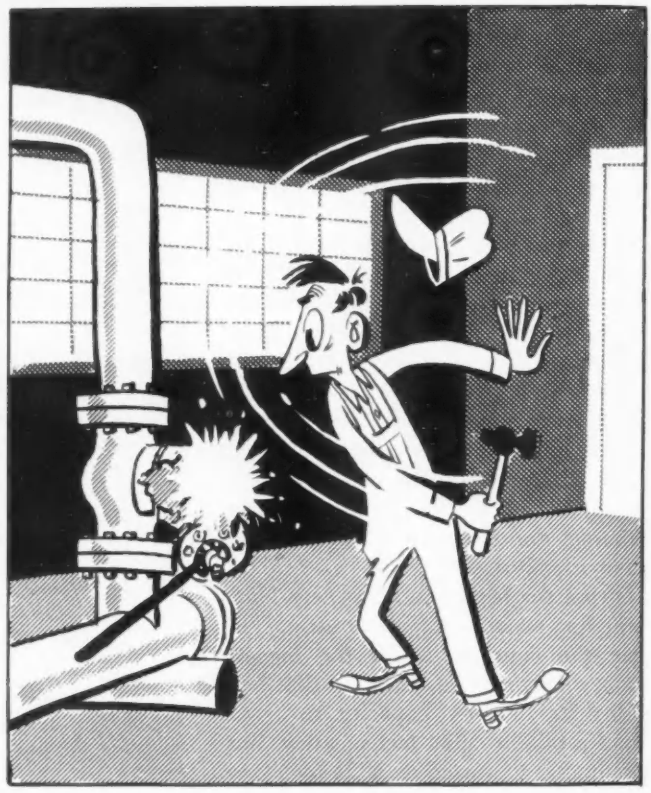
COATING AND WRAPPING operation on the 26-inch Third Line, north of Clifton, Kansas.

8th in a Series

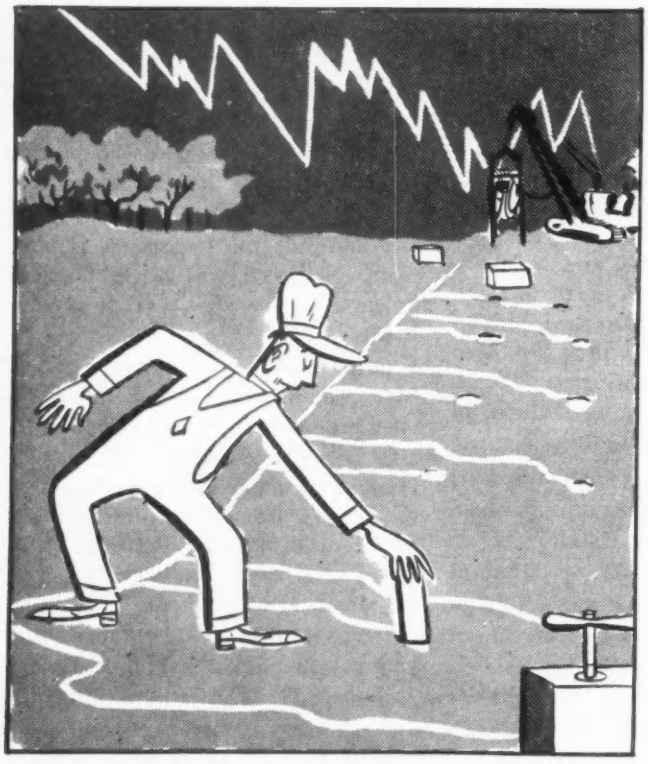
Perils of Pipeline Pete



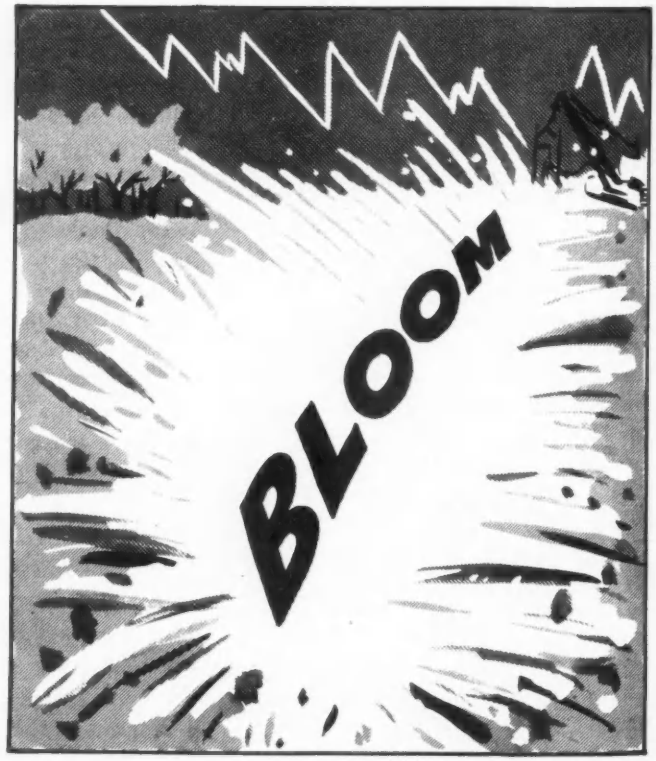
For lack of a little lubrication . . . .



. . . . Pete shuts down the entire station



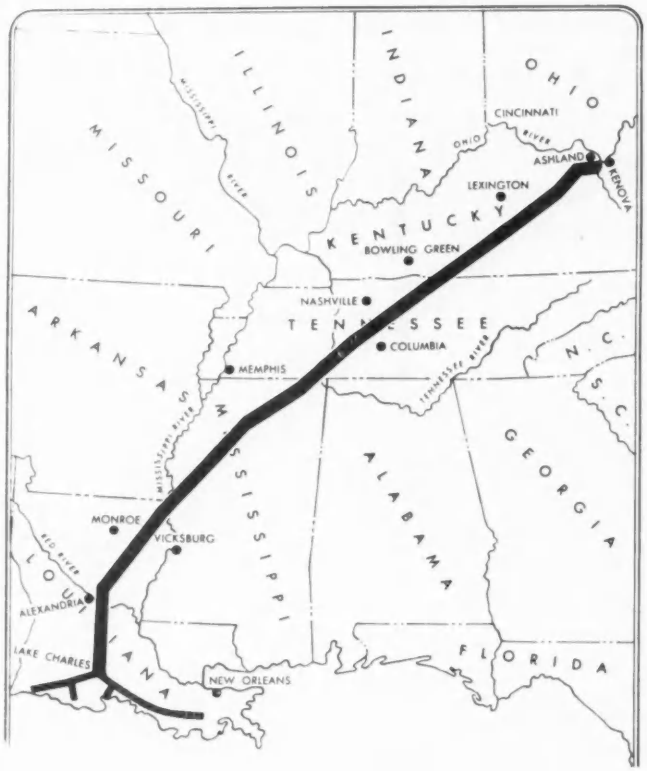
Lightning flashing in the sky . . . .



. . . . we'll see Pete in the bye-and-bye

WHAT'S HAPPENING
IN PIPE LINE CONSTRUCTION

By **THERESA K. MARTIN,** WORLD OIL Staff



Huge Gulf Line Contracted

Gulf Interstate Gas Company of Houston has received Federal Power Commission approval to build an 860-mile pipe line extending from a point in Acadia Parish, La., and extending across Mississippi and Tennessee to a terminus in Boyd County, Ky.

Contracts have been let on the huge 30-inch pipe line, largest project of its kind authorized in recent years. The project also includes 229 miles of various size lateral lines and five compressor stations, each with a capacity of 8000 horsepower.

H. C. Price Company of Bartlesville, Okla., will construct the northern section of the main line from a point near Kinkade, Tenn., extending in a northeasterly direction to the terminus near Kenova, W. Va. The southern section of the main line, which runs from near Lake Charles, La., to Kinkade, will be constructed by Houston Contracting Company, Ltd.

The system, estimated to cost $129.5 million and scheduled to be in operation by Nov. 1, 1954. will be used to transport 375 million cubic feet of gas per day to United Fuel Gas Company of Charleston, W. Va.

Pure Co. Completes System Connection to Platte Line

Pure Transportation Company, subsidiary of The Pure Oil Company, has completed a 45-mile, eight-inch crude line, having a daily capacity of 25,000 barrels. The line runs from Kimball, Neb., to Gurley, Neb., where crude enters the Platte Pipe Line, in which The Pure Oil Company is a shareholder. The company is also completing a six-inch gathering system which originates in Kimball and will serve the South Kimball pool, Enders, Goodwin and southwest Potter pools, as well as other neighboring pools.

Northwest Natural Withdraws Bid to Serve Pacific Northwest

Northwest Natural Gas Company withdrew its application before the FPC to build pipe lines into the Pacific Northwest area from Canada.

The action was filed as hearings resumed after a five-week recess on competing proposals. Northwest's move left two rivals for permission to bring natural gas service into the Pacific Northwest: Pacific Northwest Pipeline Corporation and West Coast Transmission Company. West Coast seeks authority to run pipe lines from Canada while Pacific Northwest wants to build a transmission system from the San Juan Basin in New Mexico and Colorado.

Colorado Interstate Natural Gas Company, an intervener in the case, testified on its desire to receive gas from Pacific Northwest Pipeline.

Service Pipe Line Lets Contract for Dakota Line

Service Pipe Line Company let a contract for construction of its Tioga-Mandan, N. D., crude oil pipe line to the O. R. Burden Construction Company of Tulsa. Burden crews will start construction in the vicinity of Tioga about the middle of this month. The 160-mile project is expected to be completed by mid-November or December 1 of this year.

The first phase of its construction will be 59.3 miles of 12-inch line south from Tioga to a point near Dunn, N. D. The next will be 93.7 miles of 16-inch line on into Mandan, and this is expected to start in September.

During August, the Burden company will begin work on two river crossings, the Missouri river and the Little Missouri.

The 153-mile line will connect Service's loading installation at Tioga to the new Standard Oil (Indiana) refinery now being constructed at Mandan. When completed, the line will have a capacity of 30,000 barrels a day, the rated capacity of the new refinery. An application has been made for subsequent additions and loops which would increase the line capacity to 100,000 barrels a day.

Ohio Fuel Gas Starts Work On $2.3 Million Project

Ohio Fuel Gas Company of Columbus, Ohio, an affiliate of the Columbia Gas System, has started work on a $2.3 million project designed to boost its capacity from Texas Gas Transmission lines.

Ohio Pipeline Construction Company of Granville, Ohio, is building a 26-mile length of 20-inch line from Ohio Fuel's Crawford station near Lancaster to a point near Mt. Sterling. Shamrock Construction Company of Lansing, Mich., will start work early this month on a 22-mile section of 20-inch line between Centerville measuring station near Dayton to Howell Junction, Greene County. Both sections are improvements on the 92-mile line from Centerville to Crawford Station, one of the largest natural gas compressor stations in the world. The 48 miles of pipe line is scheduled for completion during August.

FPC Okays Permian Basin And Northern Natural Plan

The Federal Power Commission has authorized Permian Basin Pipeline Company, of Chicago, Ill., Northern Natural Gas Company, of Omaha, and El Paso Natural Gas Company to construct facilities to provide ultimately an additional 300 million cubic feet of gas per day to Northern.

Permian will build a pipe line system in Texas and New Mexico through which it will deliver 200 million cubic feet of gas per day to Northern in the first year of operation and 300 Mmcf daily thereafter. Permian will deliver these quantities of gas to El Paso at Wasson, Texas, and El Paso will deliver an equivalent quantity of gas to Northern at Dumas, Texas, for the account of Permian.

Permian's proposed system will include a total of 164 miles of pipe, ranging from 16 to 30 inches in diameter, and four compressor stations with a total capacity of 54,880 horsepower. Total cost is estimated at $42.5 million.

Northern Natural Gas Company's authorization covers only their first-year construction program, estimated to cost $33.2 million. This includes 259 miles of 24 and 30-inch pipe and a total of 50,400 hp in compressor capacity. In the second year, the company plans to build 204 miles of 24, 26 and 30-inch pipe and 22,800 hp in compressor capacity at an estimated cost of $22.6 million.

El Paso was authorized to construct and operate compressor, measuring and regulating facilities, at an estimated cost of $2.9 million, to enable it to receive up to 300 Mmcf daily from Permian and to transport and deliver equivalent volumes to Northern.

Houston Contracting Gets Texas Company Contract

Houston Contracting Company, Ltd., Houston, was awarded the Texas Pipe Line Company contract to construct a total of approximately 45 miles of crude oil pipe lines and nine gathering pump stations in south Louisiana.

Thirty-nine miles of 10¾-inch pipe line will be constructed between Erath Station and Bayou Sale Station. The contract also provides for building 6½ miles of 8⅝-inch pipe line from Bayou Sale Station to Horseshoe Bayou and Bayou Sale oil fields. Provision also is made in the contract for short mileage of gathering lines to serve West Cote Blanche Bay field.

Six gathering pump stations will be constructed on platforms set on piling over the water, and three gathering pump stations will be located on land.

Standard Oil of Indiana 309-Mile Line Completed

The new 309-mile, 12-inch Standard Oil Company (Indiana) refined products pipe line from Sugar Creek, Mo., to Dubuque, Iowa, is now in operation. At Dubuque the line joins an existing products pipe line from Standard process, Whiting, Ind., Refinery to Moorhead, Minn. The line costing $10 million and having a daily capacity of 40,000 barrels will transport gasoline, kerosine, tractor fuel, furnace oil, heater oil, and diesel fuel.

The 120-mile section from Sugar Creek to Unionville, Mo., was constructed by Sheehan Pipe Line Construction Company, Tulsa, the 186 miles from Unionville to Dubuque was handled by O. R. Burden Construction Corp. of Tulsa, Pentzien, Inc. laid the Missouri River crossing and R. B. Potashnick handled seven creek and river crossings.

Standard also has a refined products pipeline from Mandan, N. D. to Moorhead scheduled for construction this year.

Sinclair Pipe Line Company Contracts for Sale of Pipe

Sinclair Pipe Line Company has contracted for the sale of about 1600 miles of 8-, 10- and 12-inch pipe, and 14 pump stations to the River Construction Corporation of Fort Worth, the Mid-States Pipe and Supply Company of Tulsa, and Rogers and Wright, Inc., of Charleston, W. Va.

The pipe is part of Sinclair's old, multiple main line crude system, extending from near Humboldt, Kansas, to Griffith, Ind., and from Carrollton to Salisbury, Mo. The old system has been superseded by Sinclair's new 22-24-inch crude oil line from Cushing, Okla., to East Chicago, Ind., which recently was placed in operation as part of the company's modernization program.

Delivery of the pipe is to be made to the purchasers after its removal from ground, and the purchasers will offer the pipe for resale. The tonnage involved is believed to represent one of the largest transactions of this nature in oil industry history.

Telephone Companies Buy Phillips Circuits

Some 10,000 miles of communication circuits and 1300 miles of pole line formerly owned by Phillips Petroleum Company changed hands May 1 after more than 34 years of private operation by the oil company. The system was purchased by the Long Lines Department of The American Telephone and Telegraph Company, the General Telephone Company and the Southwestern Bell Telephone Company.

The telephone companies plan to supplement communication facilities to Phillips' installations and offices in Arkansas, Illinois, Kansas, Missouri, New Mexico, Oklahoma, Texas, Louisiana, Indiana, Colorado, Wyoming, Utah, Idaho, Montana and Washington.

A total of 56 Phillips' pipe line pumping stations and offices in 22 cities will be served by a 75-circuit private-line telephone system and 26 points by private-line teletypewriter service, including 8 new installations. This system will be supplemented with teletypewriter exchange service. In all, 9100 miles of private-line telephone circuits and 4500 miles of teletypewriter circuits will be provided.

FPC Okays United Fuel's $4.3 Million Construction

The Federal Power Commission has authorized United Fuel Gas Company, of Charleston, W. Va., to construct 32.5 miles of 24-inch pipe line between its Lanham compressor station in Putnam County, W. Va., to a proposed new storage pool near Ripley, in Jackson County, W. Va. The storage pool is expected to have a maximum storage capacity of 20 billion cubic feet, of which 8 billion will be cushion gas and the balance of 12 billion will be the maximum annual circulating volume. The company estimates that maximum daily deliverability from the pool will be about 180 million cubic feet.

United Fuel plans to inject about 2.2 billion cubic feet of gas into the pool from July through October, 1953. No deliveries from the pool are expected until the 1955-56 winter season, and by Feb. 1, 1958, the company expects that the pool will be capable of delivering approximately 150 million cubic feet per day.

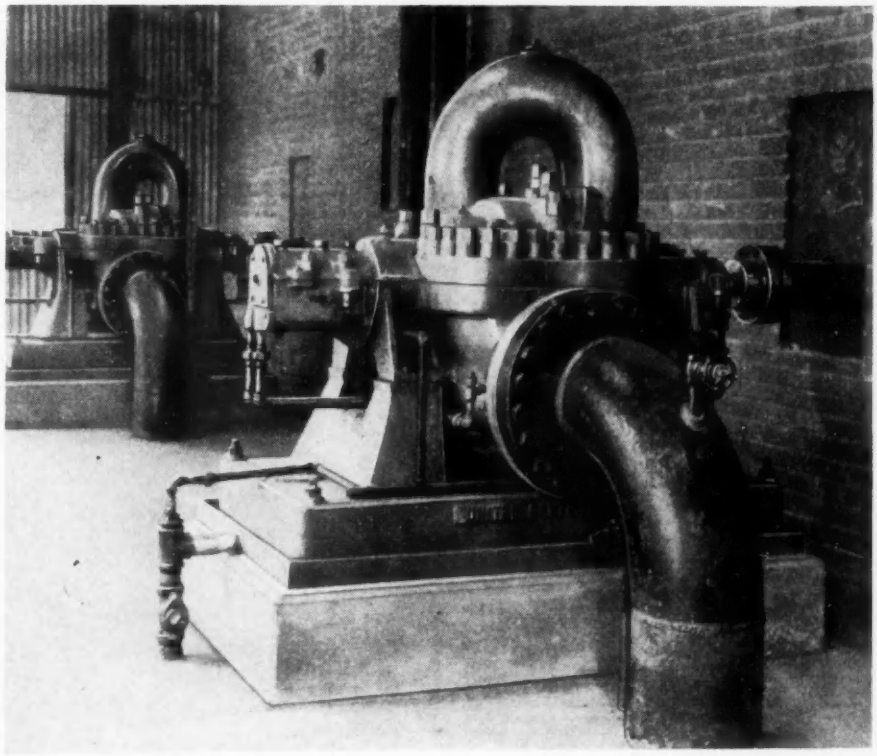
Estimated cost of the transmission facilities between the Lanham station and the storage pool is $2.5 million and the estimated cost of activating and developing the storage pool is $1.8 million. United Fuel plans to obtain funds for the project from its parent company, The Columbia Gas System, Inc.

Contracts Let on $7 Million Saskatchewan Natural Gas Line

Saskatchewan Power Corp., Ltd., has let contracts for its 115-mile, 10-inch gas line from the Brock-Coleville area near the Alberta border to Saskatoon, Saskatchewan.

The main line will be laid by Banister Construction, Ltd., of Edmonton. The Saskatoon distribution system went to Williams Bros. Canadian Corp., Ltd. This includes the city gate station, six distributing stations and two river crossings. The gathering system in the Brock field and distribution system at Rosetown and Delisle were awarded to Preston Clarke, Ltd., of Moose Jaw. Total estimated line cost is $7 million.

Shareholders in Saskatchewan Power Corp., Ltd., are Phillips Petroleum, Husky Oil and Refining, Canadian Southern Oils, and Royalite Oil companies.



NEW ADDITIONS—Phillips Pipe Line Company's expansion includes these two-stage centrifugal pipe line pumps at the Odessa (Texas) Station.

Phillips Pipe Line Company Expands Crude Line Capacity

Phillips Pipe Line Company is increasing the capacity of its existing 12-inch crude line running from Odessa to Phillips Petroleum Company's Borger, Texas, refinery by installing ten four-cycle supairthermal spark-fired gas engines for pumping service. The engines will operate in pairs and are located at Odessa, Gaines, Slaughter, Olton and Canyon. They are rated at 975 horsepower at 475 revolutions per minute. If conditions warrant, the rating could be increased to 1265 HP at 475 RPM with minor timing adjustments and colder cooling water. This reserve power would permit increasing line capacity in the future without large capital expenditures. This project, when completed, will increase capacity 23,000 barrels a day.

Morganfield Natural Gas Would Build Kentucky Line

An FPC hearing is in progress in Washington, D. C., on an application by Morganfield Natural Gas Company, of Morganfield, Ky., requesting authorization for the construction of a 31-mile natural gas pipe line extending to Morganfield from a connection near Providence, Ky., with the interstate natural gas transmission system of Texas Gas Transmission Corporation, of Owensboro, Ky.

The Morganfield company plans to transport natural gas to be obtained from Texas Gas for delivery and sale at wholesale to the cities of Providence and Sturgis, and for delivery and sale at retail in Morganfield, Clay, Diamond, Wheatcroft and Sullivan, all in Kentucky.

The proposed project is estimated to cost $1 million, including distribution facilities in the towns to be served at retail. Cost of the lateral line alone would be $580,000.

Canada Grant Encourages Westcoast in Pacific Bid

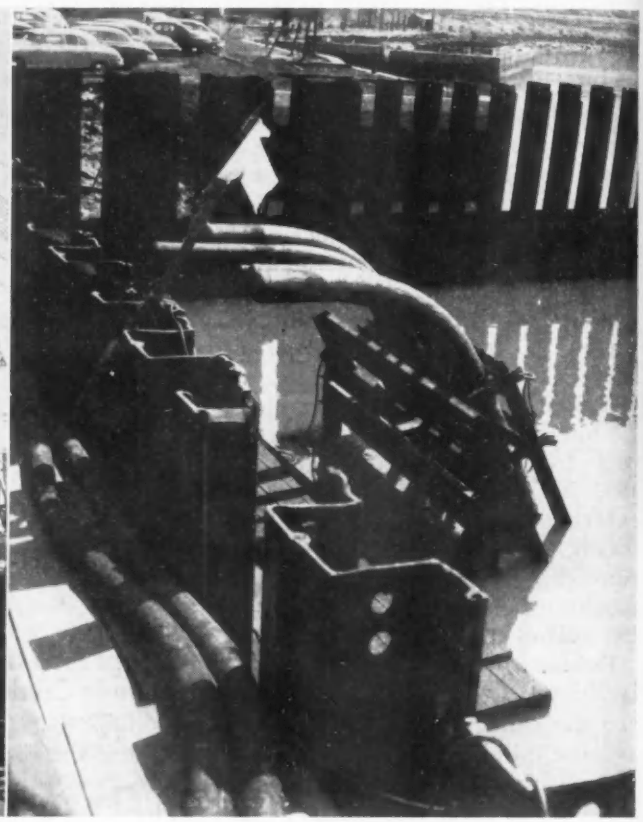
Westcoast Transmission Company, Ltd., has crossed another hurdle in its FPC application to serve the Pacific Northwest. Westcoast has been granted a 22-year permit by the Federal Government of Canada to export natural gas to the United States from the Alberta-British Columbia Peace River area. The company previously held a one-year permit, renewable from year to year, and holds a 22-year permit from the Alberta Provincial Government.

Some concern had been expressed before the FPC over the short-term limitation of Westcoast's Canadian export permit.

How to do it

PIPE LINE HINTS

$10 is paid for each illustrated acceptable contribution. Mail to The Editor, WORLD OIL, P. O. Box 2608, Houston 1, Texas



Making a Multiple Pipe Line Crossing Over River

The Atlantic Refining Company clamped five pipe lines together, placed them on rollers and pulled them across the Schuylkill River.

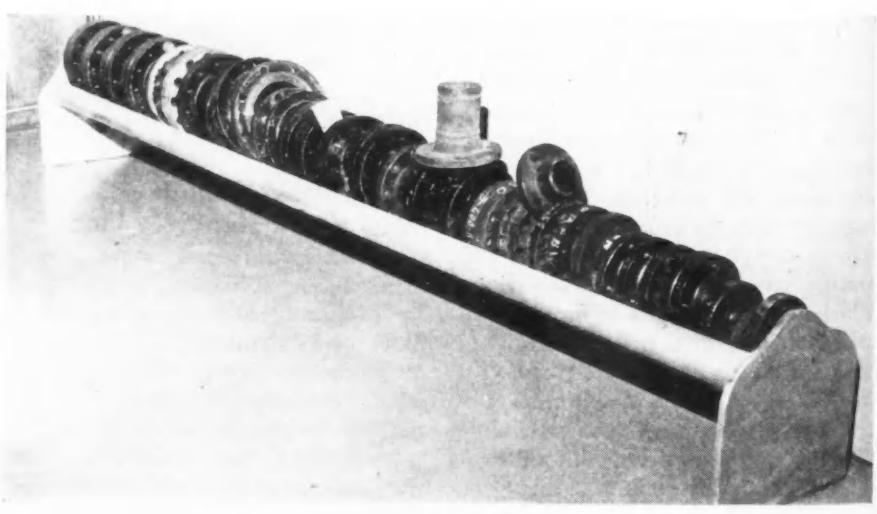
The first step in making this unusual crossing of the 720-foot-wide river was to dredge a 35-foot-deep ditch across the bottom. Then the lines were welded up complete with risers. After they were coated, river clamps were applied and the risers were braced to withstand the strains of launching.

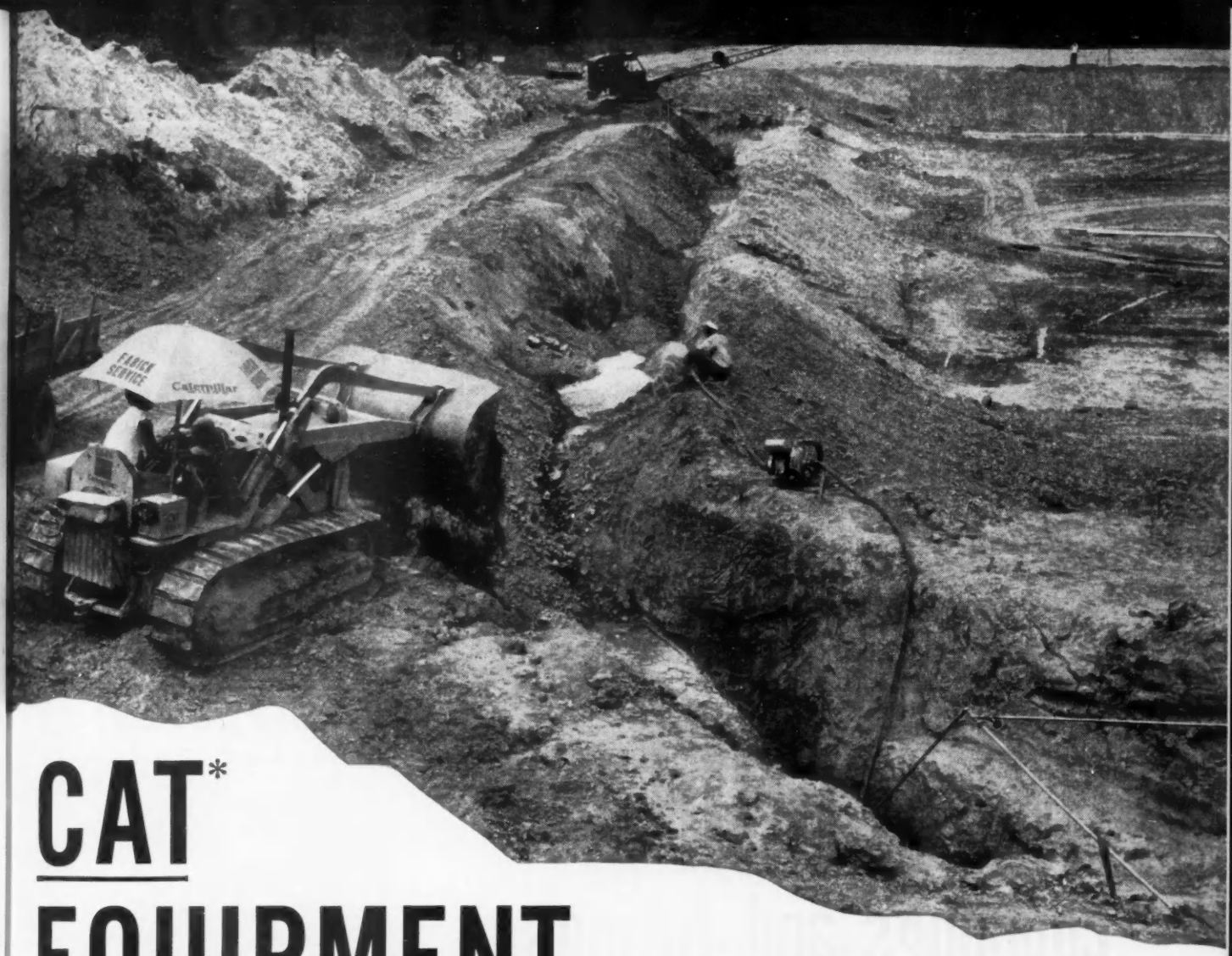
For most part power for the pull came from a steam driven winch on river bank opposite the launching site. Two derrick barges were used for the pull. One supported the risers at front. The other eased the weight of the line in the ditch. Two tractors pushed from the launching shore.

Storing Flanges

Why stack flanges on top of one another or hang them on the wall when you can store them in a rack like this one that is easy to make? Ordinarily flanges pose a difficult problem around station warehouse. More often than not they end up on the floor or in bins. This simple rack can hold all of the flanges ordinarily stocked by a station.

Weld two lengths of 3-inch pipe to end plates cut from ¾-inch plate. Space the two pieces of pipe closer together at one end than at the other, in order to accommodate various sizes.





CAT* EQUIPMENT DOES "THE BEST JOB IN THE LEAST AMOUNT OF TIME"

In abandoned Illinois oilfields, there is a known reserve of more than 500,000,000 barrels of oil. The Texas Co. has a project outside Centralia which will water-flood oil pools to recover this oil.

G. E. Tillman Co., Inc., Centralia, contractors, used two Caterpillar HT4 Shovels on the project. The versatile HT4 Shovels had the job of back-filling trenches and grading the pit. They also loaded steel, repaired roads and set 24" and 26" pipe.

"We depend on our Caterpillar equipment to do the best job in the least amount of time," said C. R. Beltz, superintendent, *"and we are never disappointed."*

A Caterpillar HT4 Shovel—the only tractor-shovel completely designed and built by one manufacturer—has its hard work built into it at the factory. Its girder type frame is cross braced to give it strength at the hinge point. Box section, all welded lift arms are cross braced to eliminate twisting. Its 80", 1¼ cubic yard bucket is wider than the widest part of the tractor, allowing the unit to cut sidewalls clean and work close to walls.

And, of course, the unit is powered by a trouble-free Caterpillar Diesel Engine. It's the engine that operates on inexpensive No. 2 furnace oil—and idles without fouling.

Combine this versatility, strength and economy with efficient day-and-night Caterpillar service and you have a unit that will really smash operating costs. Ask your Caterpillar Dealer for a demonstration on your job. And do it today.

Caterpillar Tractor Co., Peoria, Illinois.

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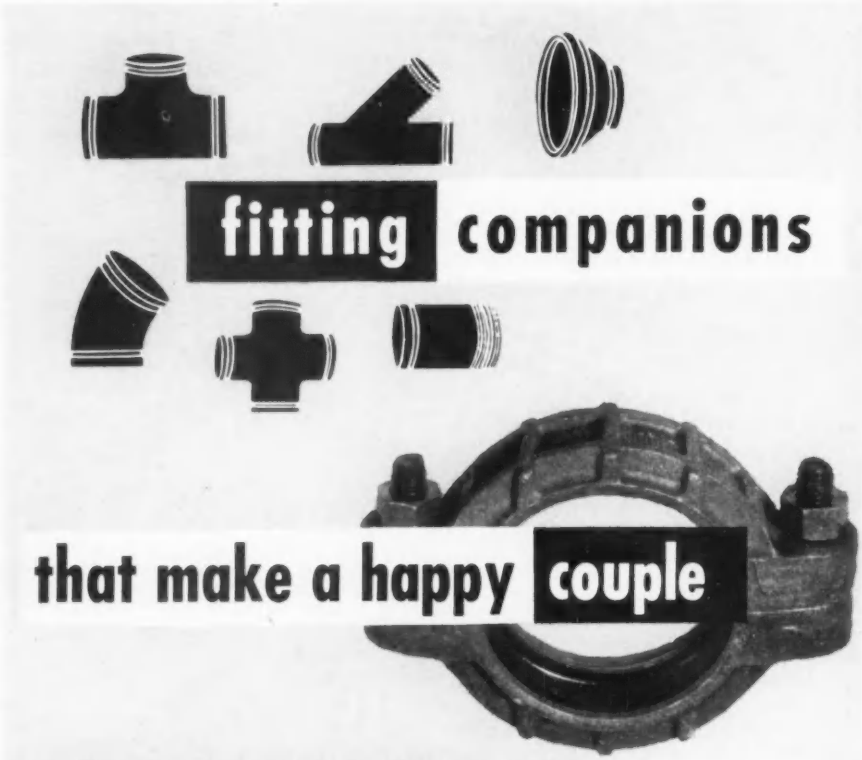
NAME THE DATE... YOUR DEALER WILL DEMONSTRATE



fitting companions

that make a happy couple

GRUVAGRIP

couplings and fittings

Gruvagrips are rugged, low cost couplings for grooved end pipe. Easy to apply and remove. Just 3 parts—synthetic rubber gasket and twin iron housings held by 2 bolts. Can be used over and over on 1½" to 14" grooved end pipe carrying air, gases, water, oil, chemicals, pulverized minerals, etc. **Gruvagrips** permit misalignment, allow for shock, end pull, vibration, up to 7° deflection.

Gruvagrip fittings. Long life and free flow are built into tough, shockproof metal. Sections are perfect circles inside and out. 100% reusable. Rust inhibitor prime coat. Sizes—¾" to 12".

Your supply houses carry **Gruvagrips** and a complete line of **Gruvagrip fittings.** Look them over this week, or write the manufacturer for full descriptions, list of users and prices.

Use plain end pipe? Write for information on Rolagrips, strong, light, handy couplings for plain end pipe.

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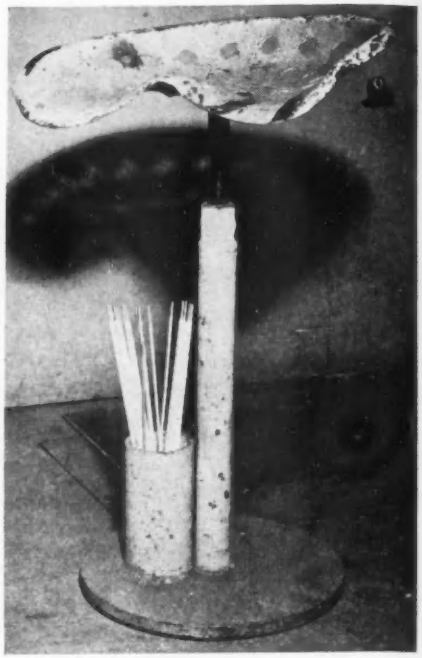


Making Pipe Stool

Welders will find it easier to work by using this adjustable stool made from scraps and the stool is simple enough that welders can make it themselves.

To a ¼-inch rounded steel plate about 20 inches in diameter weld a 30-inch section of 1½-inch scrap pipe. On top of this upright pipe weld two ⅞-inch nuts.

The seat is mounted by welding an old cultivator seat to a 30-inch section of threaded bar (⅞-inch in diameter). After it is welded, screw the seat down into the upright section of 1½-inch pipe. The seat level can be raised or lowered by spinning the seat.

Building Walkway

Here's a simple walkway for the line walker, sturdy enough to last for

years and made out of scrap pipe and 2 x 12's. It was made by driving two pipe bents into the banks on either side of the gully, and then welding horizontal pipe spans to the center of the bents.

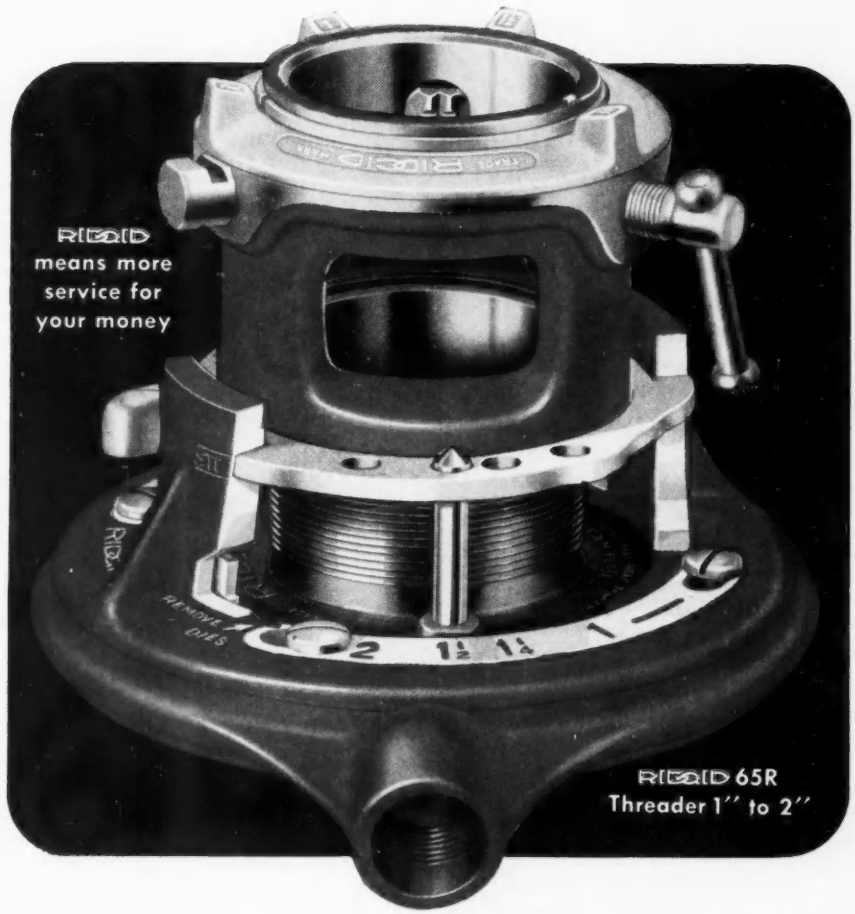
The walk is made from 2 by 12 planks which are laid on pieces of angle iron welded to the runners. The angle irons are welded to the runners so that they come on the ends of the planks. Thus the ends are supported evenly to make a smooth joint. On the ends of the bridge, the approach is made by laying a plank on two pieces of angle iron welded to the cross member as shown.

Holding Tools on Truck

A 12-inch wide piece of metal grating attached to the gin pole of a truck keeps oxygen and acetylene bottles as well as small tools from falling off an oil field body truck.

The grating is attached to the pole by three short pieces of extra-heavy 1-inch pipe which are pushed through the poles and welded to both sides of the pole.

The grating is welded to these short lengths of pipe. The top edge is covered with a rail of rod to remove the hazard of the sharp edges of the grating. When the gin pole is in use, the grating can be removed.



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Keep Rights-of-Way Cleaned Up

You can maintain oil and gas line rights-of-way better, quicker and at less cost with a Caldwell S-2 Rotary Brush Cutter. The 57-inch Spring Steel Blade will cut brush up to two inches thick, and better, and will do it in a once-over. Trouble-free operation. Timken Bearings, Blood Bros. Universal. Users include Tennessee Transmission, Transcontinental, Texas Illinois Transmission, others. We'll give you a demonstration. Write Dept. W.

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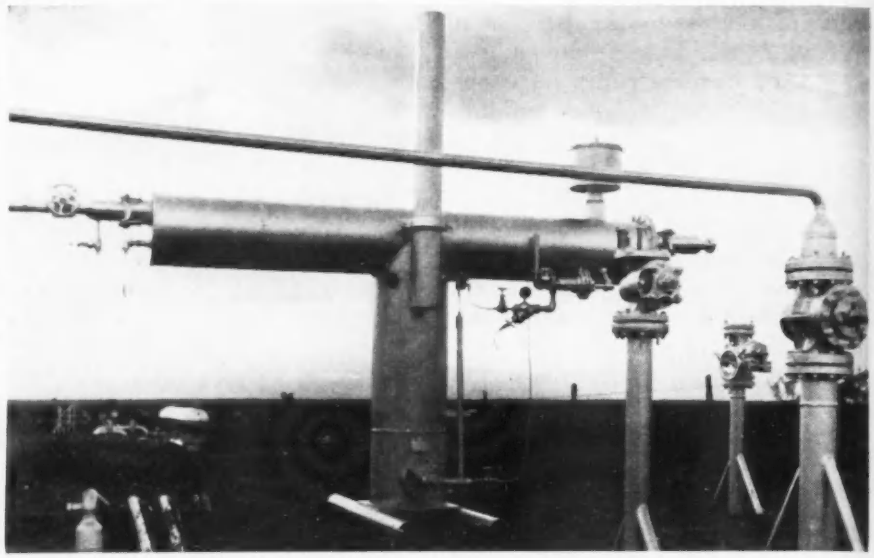
HINTS . . .

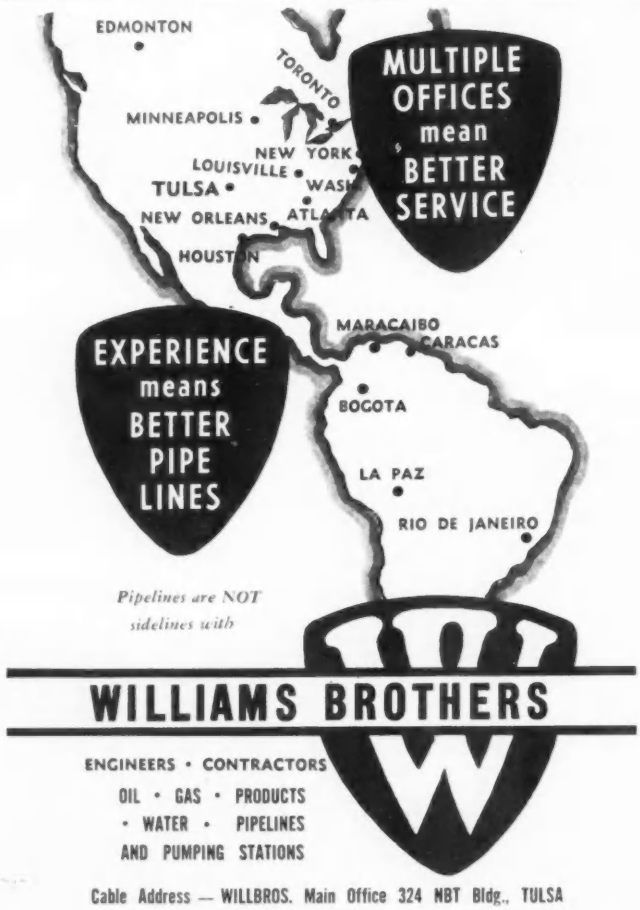


Preventing Gas Line Freeze Up

Here's a heater made mostly out of scrap materials that prevents freeze-up of a wet gas line entering a compressor and dehydration station during cold winter months.

Gas flows through the heater from left to right. Note that diameter of the flow line has been increased in order to achieve lower velocity and more heat exchanged area inside the heater. The line passes through a water or oil bath which transfers the heat from flame to gas.

Fuel for the pilot flame and burner is taken from the warmed downstream side of the heater at left, piped back through the heating fluid and then into regulator at right.



Dancing is part of the entertainment program at the East Texas District camp of Shell Oil Company.

Camp Life Is Fun

The employees at Shell's East Texas camp live outside Kilgore. But they're not outsiders . . . they are a part of the community.

By DON KLIEWER, WORLD OIL Staff

ON THE KILGORE map, Shell Oil Company's East Texas District camp is a mile and a half from the important field supply center. But in the city's mind, it lies much nearer the heart of the community—because camp interests are inextricably knit with those of other residents of the famed East Texas municipality.

This interweaving of activity is echoed wherever oil camp and city meet along the length of the famous field. At Shell's camp, work, living and play go hand in hand. And in a setting carefully conditioned to extract the greatest initiative and response from employes.

It works, starting from the time a new employe leaves downtown Kilgore and guides his car through the camp gate less than five minutes later.

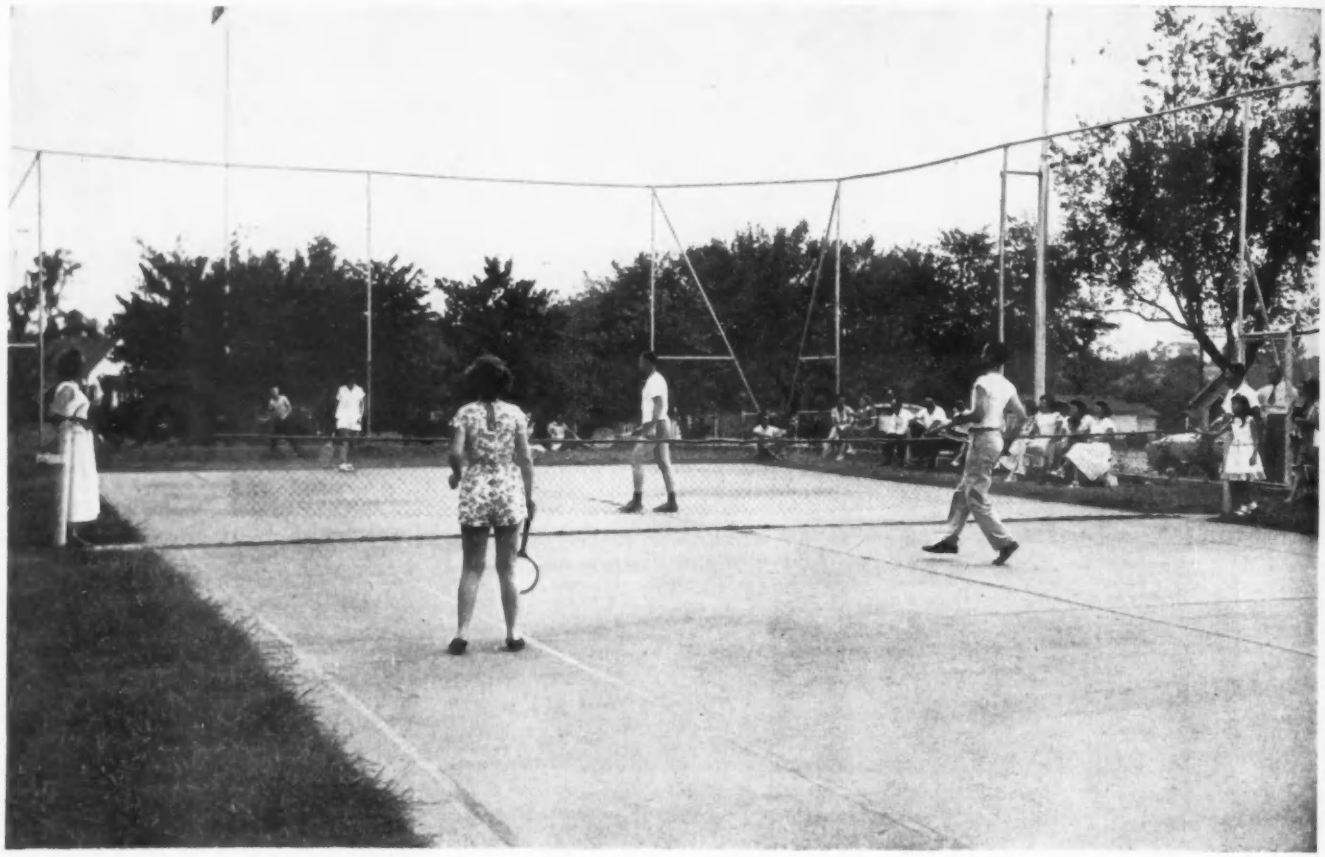
Greeting his arrival are wide, paved, clean streets which checkerboard the grounds. To his right are a large recreation hall and roomy white houses and their well-kept yards. Trees lining the streets are whitewashed to a uniform height. Happy youngsters at play alongside carefully-tended flower gardens attest to the satisfaction of camp life. It quickly becomes clear that this satisfaction is paralleled by an earnest pride on the part of both company and employes.

While the houses for the district superintendent and production foremen are uniformly white in color and are of the same basic pattern, no two houses are exactly alike. Each house is distinctive, and the interiors reflect the diverse interests of the residents.

Camp life in or near an oil field town is inevitably interwoven with municipal activities. Employes share with townspeople identical responsibilities and benefits.

Employes' children are educated in city schools, swim in the municipal park pool and watch the daily newspaper for their favorite movies. Camp families attend local churches and

Continued on page 244
Pictures on pages 242, 243 and 246



Tennis is only a part of the camp recreation program . . . for players and spectators alike.

Softball is for the more active menfolk. Here a Shell man takes his swing in a game at Kilgore park.

Parades in Kilgore are big events. This Shell float was an entry in Oil Progress Week celebration.

Parties are for whole family. Here's a Christmas gathering in the spacious recreation hall.

Camp Life

Continued from page 241

social functions, just as their neighbors outside the camp, and camp wives shop at downtown stores.

Vital to Community. One store owner who supplies the needs of many oil field camp families had this to say about camp dwellers:

"These families from adjacent oil company camps are important to the city of Kilgore—not only in terms of the money they spend with local merchants but also in the manner in which they support the city and municipal functions.

"While we know that in all probability many of these families would not live in Kilgore if the camps were not here, we are happy to have them. And we don't look on them and their companies as anybody but Kilgore residents."

A civic leader, a long-time Kilgore resident, voiced high praise of oil field employes.

"When East Texas oil brought thousands of newcomers to nearly every town and city in East Texas, we were sorely put to meet increasing requirements. But, you know, the oil people—companies and workers alike—pitched right in and helped us.

"We give them full credit for what they've done to help the growth and development of our city. Many of these who came in the early days have left, but a lot stayed on. And those who remained have continued their wholehearted support of the city."

The benefits of oil company camps and personnel to a city is equalled by the value of the city to camp personnel.

One Shell camp employe summed up his feelings thus:

"Of course, company needs dictate the site of an oil field camp. But since one is required here, we're happy. Because Kilgore is a clean, progressive city. A nice place to rear a family. We feel we're just as much a part of Kilgore as our neighbors outside the camp. We feel it is 'our' town. And I believe other oil company camp families throughout East Texas feel the same way toward whatever town is nearest them."

Recreation Hall. The Shell camp recreation hall is one example of the city-camp interweaving of interests and cooperation. The large building is the site of company safety meetings and other business affairs; Shell Club dances, parties and other social functions; regular meetings of the East Texas Chapter of the API.

It is also shared with city organizations, such as the Square Dance Club, various lodges and for church socials, Parent-Teacher Association meetings, garden club meetings, sorority functions, etc.

And outside organizations are not charged for the use of the hall!

Just as their neighbors outside the camp, many Shell employes boast hobbies at which they have become adept. One camp wife, Mrs. Lee Price, molds, bakes and dresses miniature figurines—and her home is invariably pointed to as a place of interest to camp visitors. She operates her own baking oven.

The visitor interested in viewing her extensive collection is met at the door by a gracious welcome—similar to that which he will find if he takes a turn through some of the private woodworking shops which are not uncommon.

Hobbies for many spill over into the field of athletics, and the company has developed a well-rounded program for baseball, tennis, golf, basketball, picknicking, etc. Until the Kilgore Little League organization had begun operating, the company sponsored a boys' baseball team.

Just across the street from the administration building the company has built a tennis court. And many an evening meal has been delayed because an entire family became engrossed in an exciting match.

The Shell baseball team regularly enters the city tournament. The games are usually played under lights at night on a city diamond and normally draw throngs of supporters.

Inter-camp and city golf tournaments bring out heated but friendly rivalries. Matches are played on the city course.

It is during the festive seasons that Shell camp families and Shell families residing outside the camp have spirited reunions. And the recreational hall again becomes the focal point of interest.

Happy Holidays. At Christmastime, children of Shell families stream into the hall for their annual party and to meet Santa Claus, always laden with pre-Christmas Eve toys and candy. Again at Easter the recreational hall becomes headquarters for an annual Easter egg hunt as happy children spread out over the grounds to try their luck.

But they are safe—and that's the keynote at Shell's camp, just as all other company camps, for children as well as adults—because traffic is slowed down to a snail's pace inside the camp limits.

Work, as well as entertainment, can be enjoyable under the right conditions. Shell, like other oil companies, has found those conditions. From the initial greeting by Mrs. Bobbie Walden, one of the smiling telephone-receptionists, to the coffee cart, which appears periodically at "letdown" time, the administration building holds an atmosphere of air-conditioned coolness and friendly warmth. It makes a new employe feel that he "fits" and a visitor glad he dropped by.

Extensive Shell holdings in the East Texas district require considerable personnel, the same everyday problems that confront other oil companies and considerable paper work.

But the business proceeds with a calm sureness that bespeaks capability and contentedness that is visible at every turn of operations.

Another phase of the over-all Shell program of helping the industry and individual alike is its summer training facilities, open to college-age youths who are interested in working in the oil industry after completion of their college courses.

Last summer approximately a dozen collegians became acquainted with the Shell organization through the East Texas district office. They represented eight colleges or universities, including Wisconsin University, Wisconsin Institute of Technology, Tulane University, Rice Institute, Texas A. & M. College, University of Texas, Baylor University, and Kilgore Junior College.

And so it is that Shell's East Texas district oil camp, built and staffed to fill a business need, has furthered its objectives to benefit also the city, the county and the industry at large—along with many other oil company camps situated around and in the field's oil towns.

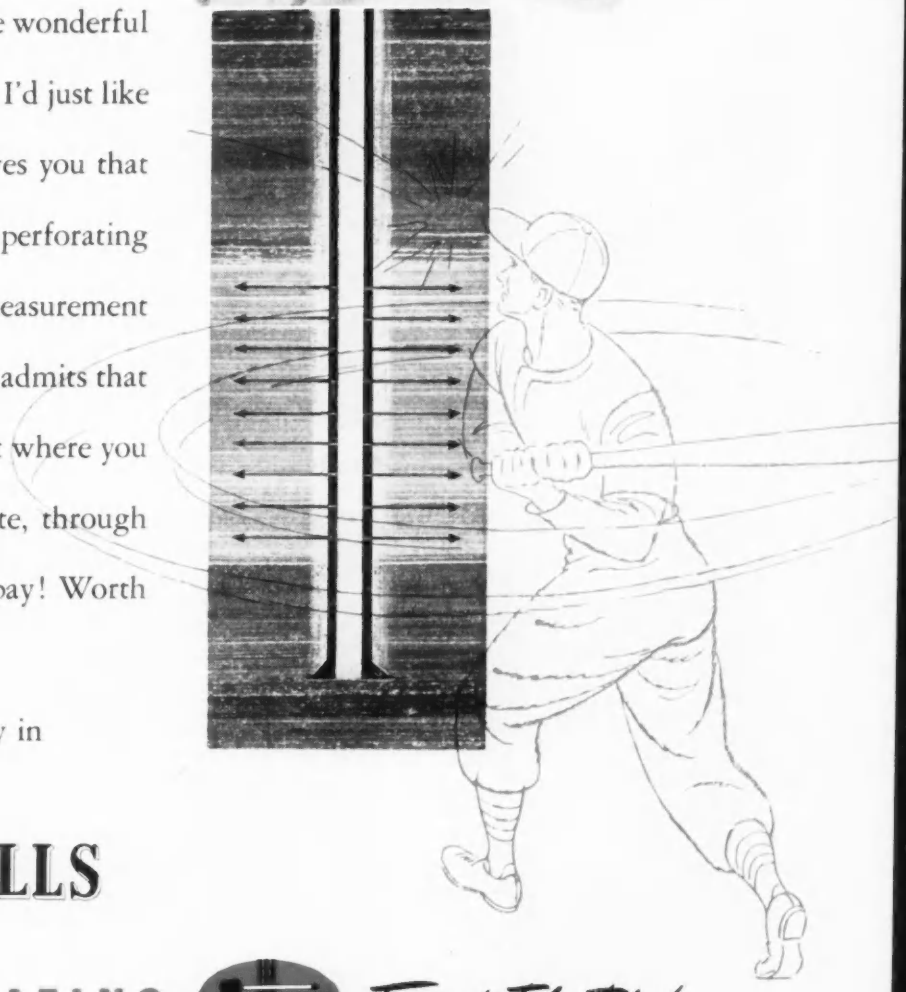
●

This feature, one of a series describing important oil camps or cities throughout the world, is intended only to describe living conditions and to give a bit of the local atmosphere. While an occasional one of the features may touch lightly on working conditions, it will do so only incidentally.

Continued on page 246

"LANE-WELLS keeps 'em in the strike zone, too"

"Sure, Art, I agree with you on the wonderful control that new pitcher has. But I'd just like to point out that Lane-Wells gives you that same kind of "control" on your perforating jobs. With Lane-Wells depth measurement accuracy (and the entire industry admits that it's tops) you get every shot right where you ordered it—right across the plate, through the "strike zone," right into the pay! Worth remembering, isn't it?"



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Collecting figurines is the hobby of Mrs. Lee Price.

Woodworking was hobby of W. S. Crake, ex-district superintendent. Crake was recently transferred to Houston.

A smile for visitors is flashed by Mrs. Bobbie Walden, receptionist.

Broad streets, neat buildings and carefully tended shrubs . . . .

Shaded lawns and no two of the houses are exactly alike . . . .

Playgrounds make camp life fun for the youngsters, too . . . . —**The End**

SAINTE JULIETTE 1, initial wildcat test being drilled by Societe Nord Africaine de Petroles (SNAP), a company owned 65 percent by a subsidiary of Gulf Oil Corporation, and 35 percent by Societe de Recherches et d'Exploration des Petroles en Tunisie (SEREPT), an agency of the French government. Well is approximately 20 miles north and slightly west of important Tunisian city of Sfax and in midst of an olive orchard.

Oil in the Olive Orchard?

SNAP's decision to drill despite lack of geological data may bring about some changes in Tunisia.

A WILDCAT in a Tunisian olive orchard may change the complexion of that land of the sailboat, camel and bicycle. Test well Sainte Juliette 1, about 20 miles northwest of Sfax city and 28 miles south of El Djem, has riding on it the hopes of the nation and Société Norde Africaine des Pétroles—SNAP for short.

A Gulf Oil Corporation subsidiary and Société des Recherches et D'Exploration des Pétroles en Tunisie (SEREPT) are hoping, too, for they own 65 percent and 35 percent, respectively, of SNAP

These hopes are admittedly high—and maybe a trifle wild—for SNAP is drilling in the dusk, if not the dark. Knowledge of the subsurface geology of the area is meager. And drilling under such conditions involves an even greater risk than in, say, the oil-producing regions of the U. S., where the industry record is one successful well out of every nine new-field rank wildcats drilled.

But even if the test proves dry, the data which can be obtained only by drilling is expected to contribute materially to evaluation of oil possibilities in this part of Tunisia.

Several years of negotiations were required before this test was spudded-in. After a preliminary geological study was made, negotiations for exploration rights were initiated. Since Tunisia is a French Protectorate, the matter involved the Metropolitan Government of France, the French Resident-General, who holds the position of Minister of Foreign Affairs in the Tunisian Government, the Bey and other Tunisian officials. This step, which also entailed drafting and official adoption of a new oil exploration and exploitation law for Tunisia, plus negotiations relative to the incorporation of SNAP as the organization authorized to carry out the proposed exploratory project, continued until early in 1950.

In March of that year, the Tunisian government granted SNAP exploration rights covering about 5 million acres in the east-central section of the country. The concession area includes the Isles of Kerkennah and the surrounding coastal waters, and extends back over the flat coastal plain on the mainland into the more rugged basin and rangeland of West-central Tunisia.

The Western boundary of the concession is just south of Kasserine Pass, where U. S. forces stopped Rommel's Afrika Korps in World War II. Also included in the area is the Island of Djerba, famed in Greek mythology as the land of the Lotus Eaters where Ulysses stopped briefly during his long voyage home from the Trojan War.

When the concession was granted, an intensive geological and geophysical exploration was begun. An airborne magnetometer survey, covering 7721 profile miles, was completed in May, 1950. A gravity meter survey was made over most of the concession area. Seismograph operations initiated early in 1951 are still in progress.

Sainte Juliette 1 is being drilled with a heavy rig and equipment capable of going down to 15,000 feet.

What's Ahead in Germany? . . . *This interview with Hary von Rautenkranz, in charge of all domestic and foreign operations for Internationale Tiefbohr KG., known as ITAG, Celle, Germany, is an oil man's appraisal of the current activities and future hopes of his country's oil industry. Von Rautenkranz' company is the only organization in Germany which operates its own drilling rigs, has its own production and which manufactures oil field equipment.*

Von Rautenkranz' activities have taken him to South America, North America, India, the Middle East, and throughout Europe. A roustabout with Magnolia Petroleum Company in Oklahoma, Louisiana, Texas and Kansas, and with General Petroleum Company in California during 1934 and 1935, he has visited every International Petroleum Exposition at Tulsa, Okla., except the 1940 show. After the recent exposition, von Rautenkranz visited Houston, Wichita, Kansas, and Denver, Colo., before leaving the U. S. for Milan, Italy, and Germany.

His family has been actively engaged in the oil industry since 1876, when his grandfather began roughnecking in the old Wietze oil fields. With this background and experience, WORLD OIL *feels that his appraisal of the German oil industry will be important to its subscribers interested in the industry beyond the borders of the U. S.*

a WORLD OIL interview with . . .

Hary von Rautenkranz of ITAG

. . . . '20 Million Barrels a Year'

Q. *How high is German crude production expected to go in view of the application of more modern methods of deep drilling and exploration techniques?*

A. After drilling more and deeper and by employing modern geophysical methods, everyone in Germany believes our goal will be 20 million barrels of crude a year within the next few years. Not only do German operators believe this entirely possible but also does Professor Bentz, head of the Germany Geological Survey.

Q. *How many drilling rigs are currently operating in Germany?*

A. The latest figures show that 159 rigs are in operation, with 105 of them large drilling rigs and the remainder geophysical and portable rigs. Of course, this number will increase as new rigs are brought into Germany, principally from the U. S., and as new rigs are manufactured by German companies. Then, too, drilling capacity will be increased as old rigs are modernized.

Q. *Has the German oil industry been faced with any materials shortages recently?*

A. For the past year, and possibly longer, no shortages of any kind have existed. I, personally, know of no shutdowns resulting from lack of proper equipment. Manufacturing companies are speeding up insofar as physically possible production of equipment to help push crude production figures up.

Q. *How did the International Petroleum Exposition at Tulsa help you and the 41 other German oil men who attended this year?*

A. We saw that we are yet far from solving all our problems concerned with drilling and production because here you have several hundred companies solving separate problems connected with both phases. In Germany, we have not reached that happy status. You might say we are still having to solve each of our own problems as it arises.

One other thing, too, is that we are in hearty agreement with the mutual interchange of ideas and welcome such exchange.

Q. *As a practical matter, how does this mutual interchange affect you?*

A. German companies are looking forward to actual cooperation between American service companies and German organizations. Your service companies are planning to enter Western Germany to help us solve problems which are new to our producing efforts, especially in connection with secondary recovery—a major undertaking in Germany right now.

Several U. S. service companies have said they will come over as soon as possible to study the building up of German service companies, for example, cementing, logging, perforating, and field inspection.

Q. *Do contractors handle most of the drilling in Germany? Or do companies maintain their own rigs?*

A. Most of the drilling is done by companies themselves because most of the drilling concessions held in Germany are held in partnerships. With other oil companies, that is. Consequently, one of the companies is always a contractor—or acts as one in behalf of the partnership.

Q. *The German stepup in wildcat drilling and development work has led to what new field discoveries or extensions?*

A. Due to our stepup in exploration and wildcat drilling activities

during the past year, two new Heide area fields were discovered, in addition to several in the Hanover section, especially in the Rhine Valley at Stockstadt.

Also, a gas field was found at Eich and other good shows of crude were discovered south of Heidl and near the French border. This success stepped up wildcatting, particularly in the Rhine Valley.

Of importance, too, is the discovery of oil north of the Alps Mountains, near Munich, and there is expected to be extensive activity in Bavaria and Wuerttemberg.

Q. *Do you think Germany will ever produce enough crude to cover domestic requirements?*

A. As far as I know, we are still producing less than 50 percent of domestic needs. And even if we reach 20 million barrels a year production, we will still need to import crude to meet our requirements.

All German refineries have increased throughput to such an extent that at present refineries' total capacity is larger than consumption.

Q. *How far along has Germany's offshore drilling progressed?*

A. The only part available for drilling so far is west of Heide fields, owned by Dea, and they have drilled one offshore test on marginal land. But there has been no discovery of oil yet. Efforts will continue, and more and more tests will be drilled.

Q. *What is the price of gasoline in Germany now?*

A. It sells for 81.2 cents a gallon. High octane, that is. But it must be remembered—when compared to your less-than-30-cent price—that German cars give better gas mileage. For example, the Volkswagon gives better than 60 miles on 1.8 gallons of gasoline.

Q. *You are a frequent visitor to the U. S. But on this latest trip, what impressed you most?*

A. I am always amazed at the amount of money spent in research, experimenting and development work not only by U. S. oil companies but also manufacturing and service companies. I have found that equipment and instruments shown at one Tulsa oil show are already in general use upon my next trip four years later.—**The End.**

a WORLD of OIL

- **Russians talk trade**
- **Strike in Germany**
- **Hungary sets record**

By DON KLIEWER, WORLD OIL Staff

Russia: Negotiations have begun with the Italian government to trade several million barrels of crude to Italy in exchange for oil field equipment from Genoa's Ansaldo-Fossati Company . . . Colonel Sokoloff, petroleum consultant, has been sent to Rome as the Russian embassy's oil attache in behalf of the new foreign trade policy designed to export 42 million barrels of oil annually.

Colombia: International Petroleum Company discovered oil in a test nine miles northwest of its discovery well—Totumal 1. The well tested a new horizon in the Cretaceous at 5700-6400 feet, which, after acidizing, flowed at a rate of 210 barrels daily through a quarter-inch choke . . . Drilling in this shallower area will be continued, as well as in the immediate vicinity of Totumal 1.

Brazil: By 30 to 21, the senate OK'd a "Petrobras" bill amendment designed to allow private capital participation in oil development. The bill provides for a government monopoly of exploration and refining, and has been under discussion since it was submitted to congress in 1951.

Pakistan: Pakistan Petroleum Limited will abandon its well 4 at Patharia, East Pakistan, since no indication of oil was found below 5000 feet.

England: D'Arcy Exploration Company has received a prospecting license for 114 square miles east of Sleaford in Lincolnshire, resulting from geophysical work carried out in the area . . . Currently, D'Arcy is concentrating drilling efforts in the East Midlands in the vicinity of Eakring field.

Albania: The Communist government has ordered the nation's oil search budget allotment for 1953 increased by 36 percent.

Israel: The Development Department's licensing of a Toronto, Canada, group has given the "green light" to the formation of a syndicate. A. M. Abernethy of Minerva Mining Corporation and his associates, B. W. Newkirk of Newkirk and Company, Ltd., and T. R. Harrison, have four licenses covering 300,000 acres . . . Husky Oil Company of Delaware has been given six licenses for 400,000 acres, and the New Continental Company of Canada has been granted eight licenses for 700,000 acres . . . The government has awarded a total of 31 licenses covering more than 2 million acres.

Italy: Societa Commerciale Italo-Persiana of Genoa will increase its capital with assistance of Italian industries in order to negotiate with Iran for the purchase of 35 million barrels of crude annually from National Iranian Oil Company. Most of the oil would be paid for with industrial machinery, agricultural implements, motor vehicles, artificial fibres, yarns, and fabrics . . . An Iranian delegation from Teheran was scheduled to visit Italian government officials at Rome to begin negotiations for greater oil cooperation between the two nations.

Germany: Lehrte 13, drilling in the Lehrte field near Hanover, has struck oil in the Cornbrash horizon . . . A joint interest venture, well Rot 3, owned by Itag and Wintershall AG., has discovered a new crude deposit south of Heidelberg. Production tests

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You can save casing by Stage Cementing the Baker way, because with *only* one string of casing you can cement off at the shoe *and* shut off surface water. Or you can cement a well with *two producing zones* and be assured of uncontaminated cement for the upper zone. And you *never* need risk breaking down a comparatively weak formation by high cementing pressure and the extreme weight of a long cement column.

BAKER STAGE CEMENTING COLLAR

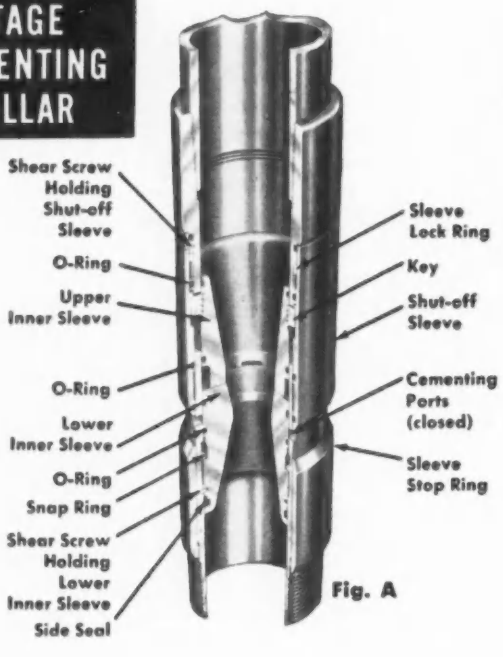

Fig. A

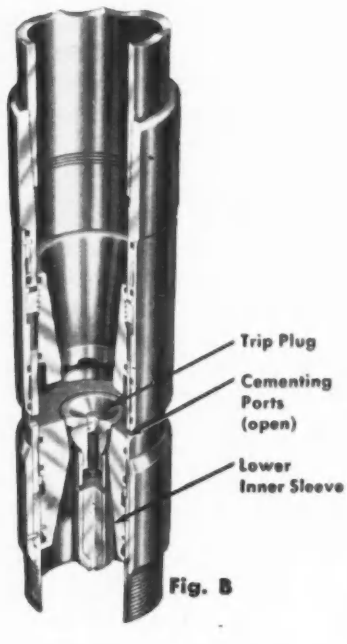

Fig. B

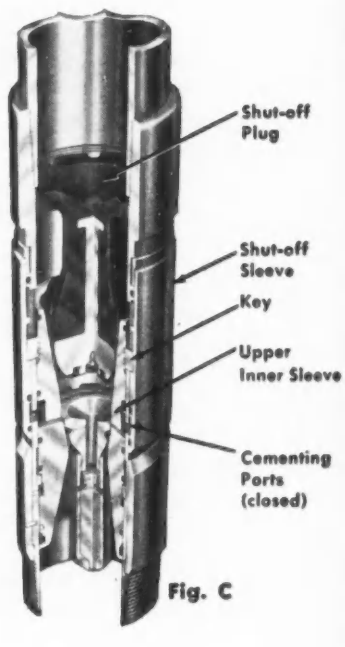

Fig. C

Fig. A—Ready for cementing the first stage. The cementing ports are covered by the Lower Inner Sleeve which is held in position by shear screws; shear screws also hold the Shut-Off Sleeve above the cementing ports. The Baker Flexible Cementing Plug (shown on opposite page) will pass through the Stage Collar without shearing the screws holding the Inner Sleeves.

Fig. B—Ready for cementing the second stage. After the Trip Plug is seated, application of hydraulic pressure shears the screws holding the Lower Inner Sleeve which moves downward, thus uncovering the cementing ports. The Trip Plug prevents passage of fluid into the casing below, and cement pumped into the casing will now pass through the cementing ports for the second-stage cementation.

Fig. C—Second-stage cementation is completed. The Shut-Off Plug has been pumped down the casing and pressure applied to shear the screws and move the Shut-Off Sleeve downward to close off the cementing ports. Note how the Sleeve Lock Ring has expanded to lock the Shut-Off Sleeve in position permanently covering the cementing ports.

See opposite page for details of operation.

IT'S SIMPLE, SPEEDY AND SAFE to perform two-stage cement jobs with Baker Stage Cementing Collars (Product No. 200-F) in combination with other Baker Equipment. In addition to positive, mechanical closing of the cementing ports upon completion of the second stage, you are assured of these outstanding advantages:

1 After the second stage has been completed, an external steel sleeve with an oil-resistant synthetic rubber seal provides positive closure and prevents passage of fluid between the inside and the outside of the casing, regardless of the condition of the cement job at that point.

2 The cementing ports of the Stage Cementing Collar may be opened at any time after completion of the first stage, and fluid may be circulated through the stage collar for any desired length of time before starting second-stage cementing.

3 Operation of the stage collar is effected by fluid pressure applications only, and no movement of the casing is required after the first stage of the cementation has been completed.

4 All internal parts of the Baker Stage Cementing Collar are constructed of readily drillable materials, and when drilled out there are no sharp shoulders or irregularities to interfere with the subsequent passage of tools through the collar.

5 Since the steel Shut-off Sleeve is on the outside of the Stage Cementing Collar, there is no possibility of accidentally opening the cementing ports when drilling out the internal mechanism, or later when bits or casing scrapers are run through the collar.

Here's how a typical **two-stage** cementing job is performed with the **Baker** Stage Cementing Collar

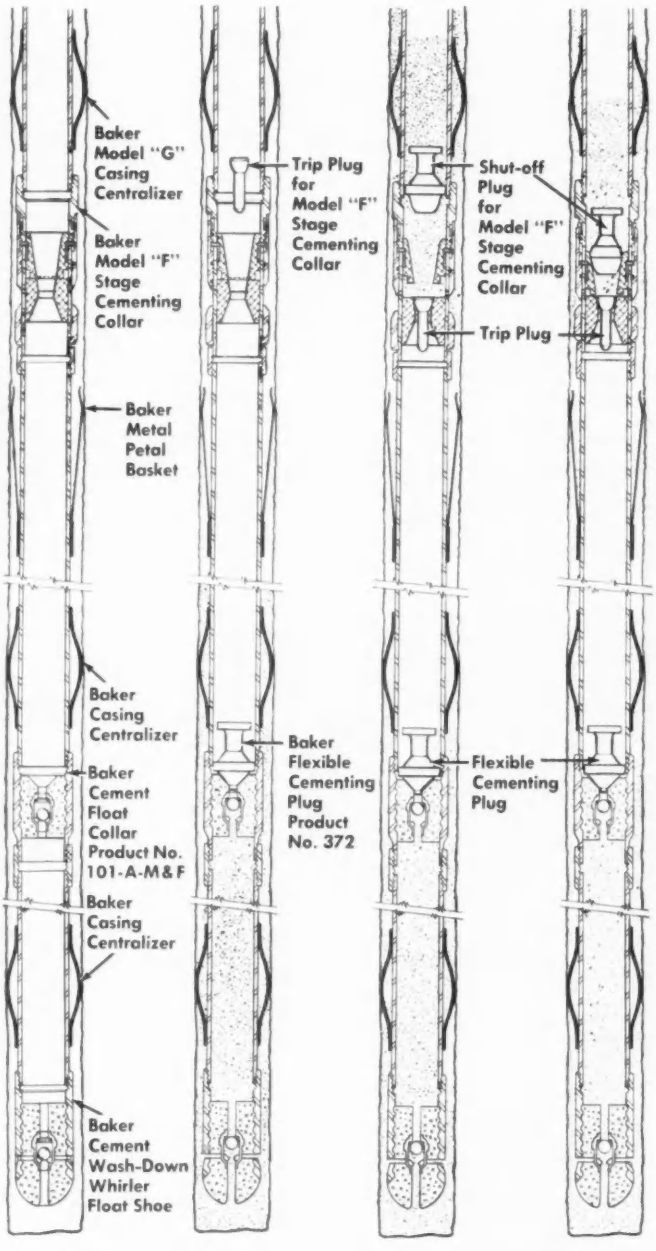
Baker Model "G" Casing Centralizer
Baker Model "F" Stage Cementing Collar
Baker Metal Petal Basket
Baker Casing Centralizer
Baker Cement Float Collar Product No. 101-A-M&F
Baker Casing Centralizer
Baker Cement Wash-Down Whirler Float Shoe
Trip Plug for Model "F" Stage Cementing Collar
Baker Flexible Cementing Plug Product No. 372
Shut-off Plug for Model "F" Stage Cementing Collar
Trip Plug
Flexible Cementing Plug

Figure 1 Figure 2 Figure 3 Figure 4

Ask any Baker representative or office for recommendations to make your stage cementing operations successful, "first-time" accomplishments.

BAKER OIL TOOLS, INC.
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Fig. 1—Hook-Up in Running-In and Mud-Conditioning Position. The string (starting at bottom) consists of a Baker Cement Wash-Down Whirler Float Shoe for conditioning the hole, washing away bridges, and cementation of the lower (first) stage. Baker Casing Centralizers are positioned at strategic points (as illustrated) to center the casing, ensure annular clearance, and avoid channeling of the cement slurry. Next above is a Baker Cement Float Collar with Seat for Flexible Plug, Product No. 101-A M.& F. A Baker Metal Petal Basket **(optional equipment) is positioned just below the Stage Cementing Collar to retain all cement slurry *above* the Basket when the second-stage cementation is performed. Note that Baker Casing Centralizers are used just above the Stage Cementing Collar to ensure annular clearance for the upward movement of the cement slurry.**

Fig. 2—The first-stage cement job has been completed. **The Flexible Plug has been pumped through the Stage Collar to its seat in the bevelled top of the Float Collar where it prevents over-pumping and also separates the cement slurry from the follow-up fluid. The Trip Plug has been placed in the casing and is gravitating to its seat in the Lower Inner Sleeve of the Stage Collar; see also Fig. B on opposite page. Application of hydraulic pressure, after the Trip Plug is seated, will result in opening of the cementing ports.**

Fig. 3—The second-stage cement job is almost completed. **The cement slurry has passed through the open ports, and the Shut-Off Plug (acting as a separator) is approaching its seat in the Upper Inner Sleeve of the Stage Collar. Note how the Baker Metal Petal Basket has prevented downward movement of the cement.**

Fig. 4—Both stages have now been successfully cemented. The cementing ports are closed off by the Shut-Off Sleeve which is locked in position as shown in Fig. C on opposite page. When the cement has set, the readily drillable internal mechanism of the Baker Stage Cementing Collar, Float Collar and Float Shoe are removed by the drilling bit leaving the full I.D. of the casing free from any sharp shoulders or other obstructions, ready for all subsequent operations.

USE BAKER STAGE CEMENTING COLLARS

yielded 106 barrels a day . . . An extension well several hundred feet from Rot 3 is being drilled to explore the Lettenkohle and Schilf sandstone . . . Itag is drilling a second offset to its Baden discovery well. Situated 2625 feet south of the original well. The Company's first offset, 2445 feet west of the discovery well, is flowing at a rate of 260 barrels daily. This drilling activity is situated along the railroad between Karlsruhe and Heidelberg.

Austria: Van-Sickle Co. plans to begin drilling of the first well in Perbersdorf, in southern Styria province—the first well to be drilled outside the Soviet-occupied zone since the close of World War II . . . At the end of 1952, the Austrian oil industry, which is Soviet-controlled and partly Soviet-operated, had an estimated 420 wells in operation.

Czechoslovakia: The industry's fuel production reached only 98 percent of the quota set for 1952.

Hungary: Zala oil field reports a new drilling record: crew on the Soviet 20/II rig, it is claimed, has drilled 963.6 feet in 60 hours . . . Discovery of the major oil field in Northeast Hungary, near Mezokeresztes village, is significant to the industry, for all other current production is situated across the country, near Lispe-Szentadorjan, and Zala county. Small fields are producing in Bihar county, East Hungary.

Roumania: Under terms of the recently-signed Prague pact with Czechoslovakia, the nation will deliver crude to the Czechs in return for motor vehicles and machinery.

Switzerland: Although the wildcat drilled near Altishofen found neither oil or gas, the hole was used for seismic studies . . . Seismic and geophysical exploration is scheduled to be conducted in the Luzern district.

Yugoslavia: The government will map and study the surface of the entire coast from Ogulin toward Dalmatia in an effort to discover likely drilling areas around Otocaz, Knin and Mostar. French and German experts will conduct the program . . . Rigs imported from Great Britain have been placed in operation in the Klostar district . . . A total of 18 wells have been drilled in the Bunjane oil field with a total production of 156,000 barrels of oil annually from a depth of 6233-8202 feet . . . The government has arranged to buy a turbobur drilling rig from Eastern Germany expected to allow drilling to beyond 13,000 feet.

Going Home

T. W. Winch (right), who recently celebrated his 50th service anniversary with Vacuum Oil Company of South Africa, Ltd., talks with a member of his staff before sailing on a two-month visit to his native England. The trip, arranged by the company in recognition of Winch's long employment record, began from Durban, where he is superintendent of the company's Williams Road warehouse.

Canada: A minimum 25-well development program for the Gull Lake area of southwest Saskatchewan will be undertaken by Anglo-American Exploration and Gridoil Freehold Leases, with the first well to be spudded-in immediately . . . This will be Manitoba's biggest oil-producing year—current production is at the rate of 500,000 barrels a year, above five times the 1952 volume . . . Mill City Petroleums and associates have established an open flow potential of 67 Mmcf. of gas daily at their Viking formation discovery Mill City-Sharples-Kroy-Sweetgrass 1 well, 25 miles northwest of Alberta's Provost Viking gas field . . . The second phase of Westcoast Transmission Company's $113 million project to pipe natural gas from the Peace River area to southern British Columbia and Pacific Northwest states has been approved by the Board of Transport Commissioners at Ottawa . . . According to the reserves committee of the Canadian Petroleum Association, more than 300 million barrels of oil was discovered in Western Canada last year.

Yugoslavian Government Plans Three Pipe Lines

The Yugoslavian government's production plan for 1953 calls for a 60-mile pipe line from Janja-Lipa to Zagreb, the capital city, includes another pipe line from Dolnja-Lendava to the industrial centers around Maribor (Marburg), and for the installation of a third line from the Vojvodina field to the consumers concentrated in northern Serbia. The 60-mile pipe line, estimated to cost $1.2 million, will be controlled by the Zagreb Gas Works, and branches will be built to villages and towns along the line.

Completion of these pipe line projects in 1953 will depend largely upon the production of seamless pipes made domestically to save foreign currency. The Sisak Iron Works has succeeded in manufacture of four-inch seamless pipe during the late fall of 1952, and pipes in this size are in mass production now. The research department is working on 14-inch diameter pipe which is scheduled to be mass produced during 1953.

In the province of Dalmatia along the coastal region, another construction plan calls for the completion in 1953 of 200 oil storage tanks of undisclosed size.

Lack of Permits Hinders Adriatic Coast Research

Ente Nazionale Metano, Montecatini Chemical Products Company, Azienda Generale Italiana Petroli, and the American Fuel and Petroleum Company are seeking research and exploration permits along the Adriatic coast from the province of Forli northward to the province of Teramo southward, over a width of approximately 12½ miles. AGIP, the Italian state oil monopoly, has been authorized to carry on geological surveys, researches and exploration in this area. Ente Nazionale Metano has drilled ten wells in the area at depths varying from 300 to 980 feet, which are producing 21,000 cubic feet of methane gas daily.

In connection with these researches, an effort is being made to convince Italian public opinion that Italy could get important economic advantages through the establishment of a gas and oil state monopoly throughout Italy for oil imports, refining, and gas and oil production and distribution.

What's Happening

AMONG WORLD OIL MEN

CALIFORNIA GROUP OFF FOR INTERNATIONAL PETROLEUM EXPOSITION IN TULSA

Twenty-one Los Angeles oil tool manufacturers and oil men traveled to the International Petroleum Exposition at Tulsa, Okla., on a special NOMADS' car attached to the Santa Fe Chief. Present in the car were Roland E. Smith of Roland E. Smith Company, chairman of the Special Car Committee for the Los Angeles Chapter of NOMADS; G. C. Averill of Cooper-Bessemer; Jack Ballagh of Jet-Lube; Jess Bailley of Western Gear Works; Charles Bannon of Western Gear Works; Joe Bergeron of Jet-Lube; Bill Bettis of Johnston Testers; A. W. Case of Case Oilfield Service; W. D. Cleghorn of Midwest Piping; John Flanagan of Johnston Testers; F. J. Hardesty of Long Beach Harbor Commission; Ron Hinman of Western Gear Works; Karl Jauman of Basrah Petroleum Company, Iraq; L. L. Jones of Cooper-Bessemer; A. S. Marshall of H. C. Smith Tool Company; W. R. Martin of Long Beach Harbor Commission; Robert Miller of Western Gear Works; Ox Morgan of Oil Well Manufacturing Company; Henry Pullman of Baker Oil Tools; Rom Rhome of Consolidated Western Steel; and H. C. Smith of H. C. Smith Tool Company.

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R. M. HURT, former engineer for The Carter Oil Company at Oklahoma City and later with Big Chief Western Drilling Company at Denver, Colo., has been appointed manager of Ganso Azul Cia. de Petroleo, with headquarters at Lima, Peru.

THEODOR KREY, Hanover, Germany, has received the annual best paper award of the Society of Exploration Geophysicists for having written the most outstanding paper published during 1952 in the society's journal. His article was entitled "The Significance of Diffraction in the Investigation of Faults." Krey is associated with Seismos GmbH, and has engaged in research in Northwest Germany, The Netherlands, Bavaria, Austria, Hungary and the North German Bay.

Theodor Krey

LAWRENCE W. LEE has been named executive vice president and general manager of Husky Oil and Refining Ltd., of Calgary, Alberta. Formerly vice president and manager of refining and sales for the parent company at Cody, Wyo., he had been on leave of absence for one and one-half years, serving one year as director of marketing and distribution for the Petroleum Administration for Defense in Washington, then attending the advanced management training school of Harvard University.

•

B. BREWSTER JENNINGS, president of the Socony-Vacuum Oil Company, Inc., New York, recently toured Europe to visit Socony-Vacuum affiliates.

New York Nomads Entertain Visitors

Visitors at a recent New York Chapter Nomads' party were (seated, left to right) P. K. Ozinga, Caribbean Petroleum Company, Venezuela; G. Rovira, Yacimientos Petroliferos Fiscales Bolivianos, Washington; A. L. Burns, Gulf Publishing Company, Houston, Texas; C. H. Bowersox, Mene Grande Oil Company, Venezuela, and G. H. Moore, Magnet-Cove-Barium Company, Houston.

Standing, left to right, are C. B. Antill, C. B. Antill & Company, Corpus Christi, Texas: O. W. Van Dyke, Magnet-Cove-Barium Company, Houston: A. G. Chandler, Reed Roller Bit Company, England; L. J. Hopkins, Basrah Petroleum Company, Basrah, Iraq; A. Heinle, Gewerkschaft Brigitta, Germany; A. Zwerneman, Atlas Pipe Company, Houston; C. B. Mays, Parkersburg Rig & Reel Company, Venezuela; Nelson Bigelow, Gulf Publishing Company, New York City; Glenn Dow, Mid-Continent Cummins Export Corporation, New York City; W. M. Thornbury, Thornbury & Geis, California; and R. J. Rhodes, Parkersburg Rig and Reel Company, Allentown, Pa.

Mexico Sets Goal of 400 Wells a Year

The Mexican government petroleum monopoly, Petroleos Mexicanos, has called for 400 wells a year for the next six years. The goal is to supply expanding domestic needs, and at the same time boost reserves from the present estimated 20 years to sufficient for 50 years.

The drilling plan was revealed in the Pemex annual report on the 15th anniversary of expropriation of foreign oil holdings. The report outlined a full six-year development plan—the six-year period corresponding to the term in office of the new national government headed by President Adolfo Ruiz Cortines.

Pemex general director, Senator Antonio J. Bermudez, who successfully piloted the government monopoly through the critical production pinch of the previous six years, will continue at his post. He is one of the few high government officials held over in office from the administration of former President Miguel Aleman.

Bermudez pointed out that present reserves, the equivalent of 2.2 million barrels of crude, are considered satisfactory. But, he added, "in order to face any contingency, and in order to be able to produce at any moment all the oil necessary to the Mexican economy we must have reserves for 50 years at the present rhythm of production."

To reach this goal, he said the minimum drilling program for the next six years must be 400 wells a year, 75 of them for exploration. This is a sharp increase over 1952 drilling of 307 wells. And 1952, in turn, was a year of more footage drilled than in any year except 1927.

In comparing Pemex operations during 1952 with the previous year, Bermudez' report showed progress in every line except production, which was about the same, and exports, which were off 30 per cent.

Present daily production capacity was put at 250,000 barrels. Total 1952 production was 78,910,000 barrels, only 126,977 barrels more than in 1951. The small margin of increase was blamed on "the restricted export market."

Pemex explained that the decline in exports was caused by a combination of circumstances which have led to a 15 percent world overproduction. The circumstances were listed as:

- An increase in exploration by private producers for competitive reasons.
- Need of producing countries to increase reserves in order to consolidate their economic position.
- Desire of both producing countries and producing firms for dollars.

As a consequence, Pemex reported, petroleum prices outside of the United States fell more than 20 per cent during 1952.

Bermudez added:

"For Mexico and the Caribbean zone, the international situation is especially unfavorable since a large part of the production is heavy crude, from which a large volume of residual fuel necessarily is obtained, and

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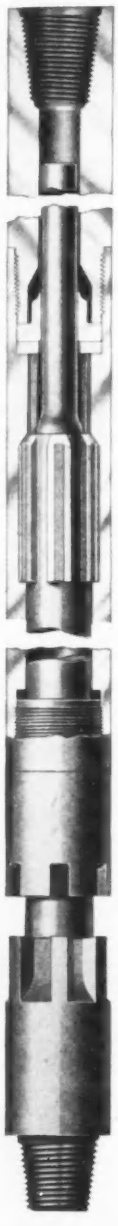

RELEASING type fishing tools such as spears, sockets, overshots and cutters require downward blows for release of slips or grapples . . . *and the handiest tool you can use to obtain downward blows when fishing with equipment of this type is the Bowen Bumper Sub.*

Operators not only find it a valuable tool for fishing jobs, but in addition use it above the bit or reamer when drilling in sticky formations. The Bumper Sub will jar down by simply dropping or springing the weight of the run-in string the full length of the stroke. Or —to free a bit or reamer—it is instantly ready to *jar up* by merely taking tension on the string and suddenly releasing it until the Sub is partly open. The rebound of the pipe causes the Sub to strike a hard upward blow. *Moreover, you can alternate upward and downward blows without making any adjustment in the tool from the surface!*

During regular drilling or fishing operations, the Bowen Bumper Sub is an integral part of the string. It easily withstands all the torsional strains of drilling and is packed off with a special abrasive and pressure resistant packing that permits high circulation pressures to be used without leakage. It is amply strong to stand the abuse of drilling and fishing under all conditions, and requires only occasional servicing.

You can use the Bowen Bumper Sub at any desired point in the drilling or fishing string. It is made for use with all standard sizes and types of drill pipe, and in special types which permit free passage of wire line tools, core barrels, etc. *Write Bowen direct for full details!*

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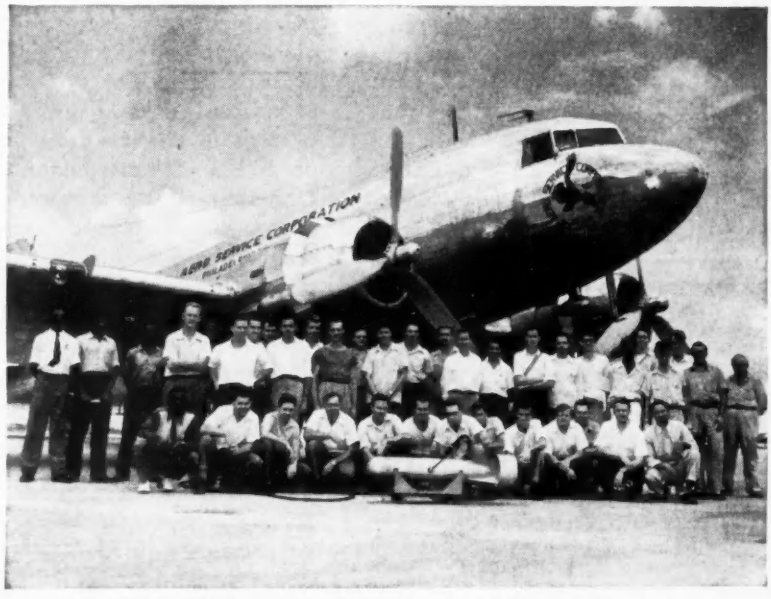

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for which world demand has fallen off sharply with no present prospect of an increase. For this reason, price of residual fuel has dropped over 30 percent in a year in the zone, and an additional price factor is that the United States, the principal consumer, is replacing it with natural gas and diesel fuel.

"Since heavy crude and residual fuel are Mexico's major surpluses for export, it is easy to understand the unfavorable consequences which this situation has had and will continue to have on the income of the institution (Pemex)."

Total Mexican exports for 1952 were 15,398,553 barrels, or 30 percent less than in 1951.

The year's exploration and drilling was highlighted by discovery of the Ezequiel Ordonez field near Tenixtepec, Veracruz State, and described as "the most important discovery since 1932." Nine wells already have been completed there with a total production capacity of 36,000 barrels daily.

Exploration during the year was carried on in 99 zones in 15 states. Six new oil and gas producing fields were discovered: Solis, Manuel Avila Camacho, Horcon, Arroyo Blanco, and Ezequiel Ordonez, all in Veracruz State, and El Mexicano in Tamaulipas State. Forty eight rigs were employed in exploration drilling, and the total footage drilled was 11 percent above 1951.

Pemex's gross income for the year was reported at $220,930,000, up $7,-140,000 from 1951. The total payments to the Mexican treasury in taxes were $60,658,800, an increase of $1,994,200 from 1951.

The report also discusssed work in progress, including extension of the pipe line system, new and expanded refinery facilities, the new lubricating oils plant at Salamanca, slated for operation in 1954, increased production at the Poza Rica sulphur plant, and the Extensive Pemex program of medical and social service to workers in the industry.

Sicily Reports Drilling, Exploration Activity

Anniable Bianco, head of the industry and commerce department of the Sicilian Regional Government, said Anglo-Iranian Oil Company has two research permits in Sicily, one of 117 acres at Ravanusa (Agrigento) and one of 83½ acres at Vittoria (Ragusa), where geophysical research work is being carried out. The permit obtained in the Priolo district has been given up.

Other activity reported is in the Trapani zone where the Italian Geological Service and the Ente Nazionale Metano, as well as a seismic party of the Askania A.G. of Berlin, are working for the Sicilian Regional Government.

The Mediterranean Oil Company has been exploring the zones of Agrigento, Caltanisetta and Ribera, while in the Ragusa zone, Gulf Oil Company is planning to drill to a depth of some 11,000 feet on their 250-acre concession. Bianco also said that research permits have been granted the Raffinerie Siciliane Olii Minerali to work in the zones of Bronte, Gioito and Lentini.

Third Well in Germany's Boostedt Field Finds Oil

In the new oil field of Boostedt, near Neumuenster (Schleswig-Holstein), a third well, Boostedt 4, has struck oil. The well is situated about eight miles northeast of the discovery well Boostedt 1. During production tests, the new well flowed 155 barrels of crude daily. Oilbearing horizons were encountered 656 feet lower than in Boostedt 1.

Since it can be expected that Boostedt 5, situated 1476 feet southwest of the discovery well, will also find oil, the new field now extends over about 1.9 miles. Deutsche Vacuum Oel AG. opened up the field for the joint Vacuum-Dea-Preussag interest.

Shell's Saskatchewan Finds Seem Promising

Two "significant" medium oil discoveries in southwest Saskatchewan were announced in the legislature recently by Mineral Resources Minister J. H. Brockelbank.

Shell Oil Company's Estevan 1, 30 miles east of Weyburn and five miles southwest of Stoughton, yielded in its first test 410 feet of gas-cut salt water and 10 feet of oil-cut mud. That was between 4174 and 4196 feet.

Shell's Estevan 2, six miles northeast of Midale, in a drill-stem test yielded 75 feet of free oil of 26 gravity at about 4600 feet.

New Equipment

SUPPLEMENTING COMPOSITE CATALOG

Wheelbase Truck

International model R-110, 115-inch wheelbase truck with 77-inch service utility body is one of the 168 basic truck chassis models in 296 wheelbases introduced with International Harvester Company's new R-line. Service utility bodies, matched to chassis and designed specifically for on-the-job service or utility work, are available on two International light duty models, the R-110 and R-120 with gross vehicle weight ratings from 4,200 to 6,500 pounds. There are two body sizes, the 77-inch for 115-inch wheelbase models and 89-inch for 127-inch wheelbase models. This model and International's other new models are powered by the 100 horsepower valve-in-head silver diamond 220 engine.

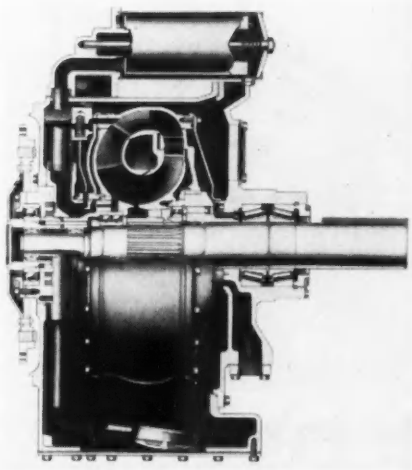
This item supplements International Harvester Company data on pages 2633-2636 of Composite Catalog, 19th Edition.

Circle No. 1 on Postcard

Industrial Drives

Four new industrial drives developed to help increase performance, extend utilization and reduce maintenance of engine-powered installations used in the oil fields have been announced by the Twin Disc Clutch Company. The new drives include a two-stage hydraulic torque converter, a two-speed transmission for use behind torque converters, a disconnecting hydraulic power take-off and an air-actuated clutch. The new Twin Disc two-stage hydraulic torque converter (Model SD with spider drive and disconnecting feature shown) will be available in industrial and truck types with variations of input and output ends and of internal blading to suit specific requirements.

This item supplements Twin Disc Clutch Company data on pages 4990-4991 of Composite Catalog, 19th Edition.



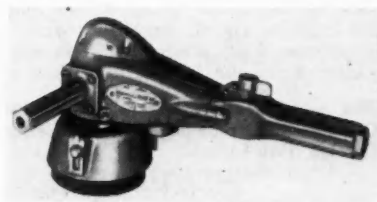
Circle No. 2 on Postcard

Steel Swivel Joints

The Hunt Tool Company has begun production of their new double-ball forged steel swivel joints. The new joints are manufactured in several types. Type D, 5000 pounds per square inch working pressure at 225 degrees Fahrenheit, is recommended for oil, water and gas service. Type D, 500 psi working pressure at 600 degrees Fahrenheit is recommended for steam service. Type E, 10,000 psi working pressure at 225 degrees Fahrenheit is recommended for cement service. Type D swivel joints are manufactured in one-inch to four-inch sizes inclusive. The Type E swivel joint is manufactured in the two-inch size only. These new double ball swivel joints are used in the manufacture of the Hunt all steel drilling hose, Hunt high pressure cementing hose and Hunt mud guns.

This item supplements Hunt Tool Company data on pages 2525-2544 of Composite Catalog, 19th Edition.

Circle No. 3 on Postcard



Angle Grinder

Ingersoll-Rand Co. introduces a new air-powered, direct drive angle grinder which eliminates the need of bevel gears or gears of any kind. The new Size 2FA-60 angle grinder has enough power for operation on practically all surface grinding, cut-off and sanding jobs. Speed at 90 pounds per square inch air pressure is 6000 revolutions per minute. Two types of dead handles are available for this new grinder, one is straight and the other is 30 degrees off of straight. These handles may be attached to either side of the grinder and the angle dead handle may be rotated to any one of four positions, thus the tool can be adapted for corner grinding or for right or left handed operators. A built-in lubricator provides ample lubrication for long, trouble-free service. The motor is muffled to reduce noise and the exhaust deflector is adjustable to deflect the exhaust away from the operator.

This item supplements Ingersoll-Rand Co. data on pages 2625-2632 of Composite Catalog, 19th Edition.

Circle No. 4 on Postcard

Save time! Keep informed! Circle numbers on postcard, page 257

Wire Rope

Production of a wire rope with a plastic core has been announced by Jones & Laughlin Steel Corporation. This wire rope was developed to replace fiber core wire rope in the drilling of many oil and gas wells. A cut-away sample of the new wire rope shows the core of plastic replacing the traditional fiber core. The plastic core is unaffected by acids, caustics and other sub-surface substances in cable tool drilling of oil and gas wells. Another innovation in wire rope manufacture recently announced by the same company is the spring-center wire rope which employs a new principle in wire rope construction. The new principle employs the ability of the coiled spring to flex and to resist crushing and the result is a wire rope with a core that is a coiled steel spring, engineered for use in rotary drilling rigs.

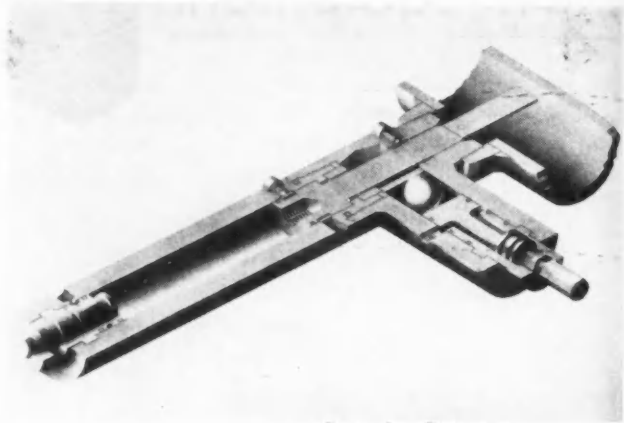
This supplements Jones & Laughlin Steel Corporation data on page 2706 of Composite Catalog, 19th Edition.

Circle No. 5 on Postcard

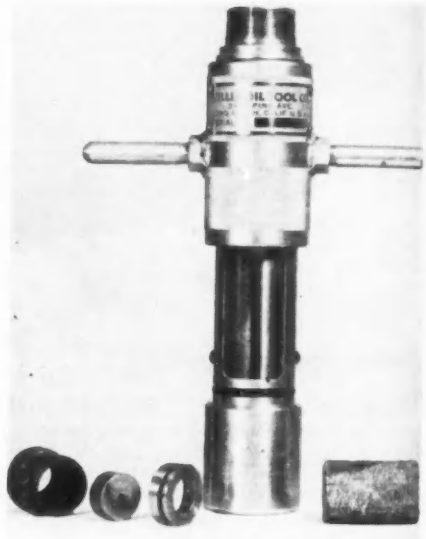
Choke and Corrosion Detector

The Willis EZXS choke is a combination of a straight line choke and a soluble plug injector. The straight line fitting is equipped with a locking sleeve that closes the access opening. The choke holder and retainer ring are easily and quickly removed at any time the operator chooses to replace the choke to inject a soluble plug to remove paraffine accumulation in the lines. The sleeve is made with a J slot lock and high pressures are retained by O rings.

Also manufactured by Willis Oil Tool Company is the Willis Corrosion Detector, designed for the injection and withdrawal of metal samples in high pressure pipe lines and closed vessels. The tool subjects the component metals of the system to the fluid for scientific study of corrosion rates without shutting down the system nor installing expensive bypass piping. A removable piston carries the sample in or out of the high pressure line or vessel. Hydraulic fittings in the cylinder are used to drive or release the piston assembly which is removed or replaced through the quick opening end of the cylinder. Two models are available, the swing check valve and the ball check valve, both constructed to hold the high pressures found in gas plants, refineries, pipe lines and well heads. The base of the corrosion detector is screwed into a standard, welded and drilled, half coupling or tee.



Corrosion Detector



EZXS Choke

This item supplements Willis Oil Tool Co. data on pages 5110-5111 of Composite Catalog, 19th Edition.

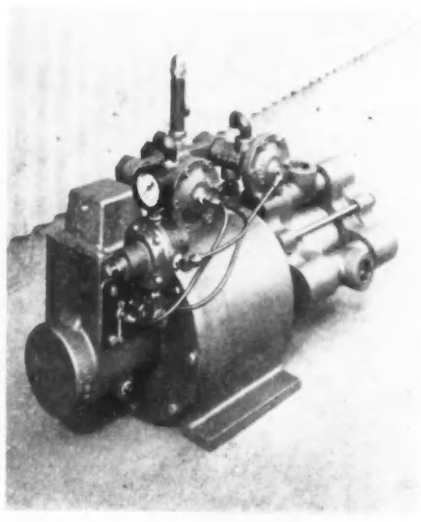
Circle No. 7 on Postcard

Glass Jet Perforators

McCullough Tool Company has announced two major improvements in their glass jet perforators. A new super casing glass jet perforator has been added to the line. This new perforator is for use in 5½-inch O.D. casing and larger. The addition of the new super casing glass jet now provides four different types of glass jet perforators in various sizes to meet the requirements of every jet perforating operation—the standard casing glass jet, the super casing glass jet, the super formation glass jet, all with steel strip carrier, and the standard casing jet with solid steel body. Internal design improvements in the glass jet units have resulted in two-thirds deeper penetration in solid steel targets with one-third less explosives. The improved design allows the use of a maximum effective powder load, gains maximum jet charge velocity and results in larger, straight-sided slug-free holes and deeper penetration.

This supplements McCullough Tool Company data on pages 3261-3300 of Composite Catalog, 19th Edition.

Circle No. 6 on Postcard



Transfer Pumps

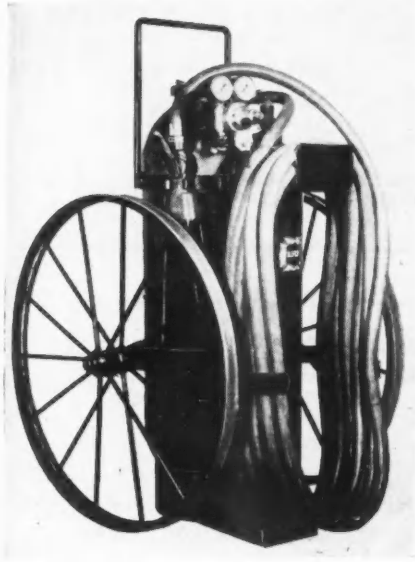
Positive displacement pumps designed for operation off maximum air or gas pressures of 200 pounds per square inch are manufactured in two sizes by Texsteam Corporation. These pumps are Series 6003 and Series 6004. The 6003 pumps have maximum constant delivery of 13 gallons per minute and maximum discharge pressure of 2000 pounds per square inch. The Series 6004 with maximum constant delivery of 27 gallons per minute has maximum discharge pressure of 900 pounds per square inch. Volumes are selective and range upward from one gallon per minute. The pumps are so designed that fluid is pulled in on one motion of the piston and discharged on both the forward and return strokes. This produces a smooth discharge regardless of injection pressure. The pumps are recommended for injecting large volumes of corrosion inhibitors, emulsion breakers and other additives into producing oil and gas wells, for high pressure liquid disposal service such as re-injection of salt water into disposal wells, and transfer of fluids. The pumps handle heavy, viscous liquids without difficulty and are ideal for lease transfer pumps.

This item supplements Texsteam Corporation data on pages 694-701 of Composite Catalog, 19th Edition.

Circle No. 8 on Postcard

Save time! Keep informed! Circle numbers on postcard, page 257

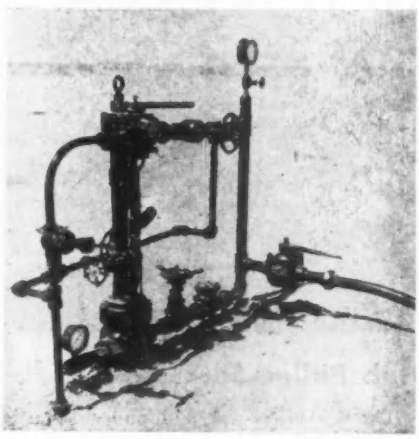
Other New Equipment



Fire Engine

The manufacture of a one-man fire fighting wheeled engine for extinguishing large scale B and C fires has been announced by the American-LaFrance-Foamite Corporation. A dry chemical wheeled engine with a capacity of 150 pounds, the fire engine discharges Alfco dry chemical. This model 150 is a companion unit to the model 350, the two-man engine with capacity discharge of 350 pounds. The model 150 weighs 480 pounds, fully charged and can be easily wheeled and operated by one man.

Circle No. 9 on Postcard

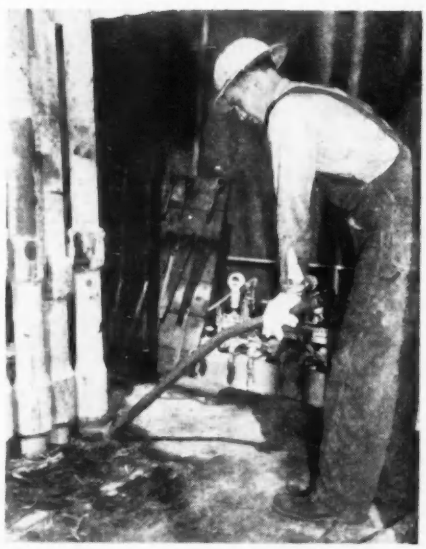


Kobe Free Pump

The Kobe free pump manufactured by Kennametal Inc. is a departure from conventional systems of pumping with walking beams and rods and offers a means of lifting oil from great depths. A Kobe free pump consists of a double acting hydraulic engine directly connected with a pump which is also double acting.

When first introduced, the engine and pump were lowered to the bottom of the oil well on a string of small tubing which also served as a conductor for the power fluid, but in recent developments tubing strings have been arranged so the unit can be circulated in or out of the wells, free of any rigid connection. The plumbing arrangement of the free pump wellhead is illustrated. The bottom hole pumping unit uses Kennametal balls and seats for check valves in the pump end of the unit. The assembly is circulated to bottom or surfaced with the same source of hydraulic power used to operate the free pump on bottom.

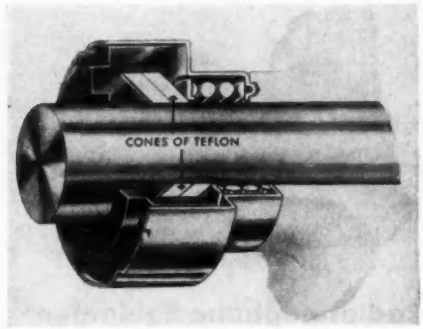
Circle No. 10 on Postcard



Drill Pipe Lifter

A simple tool for placing drill pipe in its proper position on the derrick floor recently has been placed on the market by Gem Oil Tool Co. of Lafayette, La. This new lifter also cuts down rig time by allowing the floorman to spot each stand of drill pipe in the minimum of time without danger of the jack slipping off and causing an injury. The jack is made from a bar fitted with a heel for contact against the derrick floor and a semicircular hinged shoe which fits against the face of the pin end of the tool joint. The hinge is held by a small pin and allen head screw for quick exchange where Hydril and other odd sizes of tool joints are used. The upper shoe assembly operates on a rounded fulcrum allowing the pipe to be supported through 180 degrees of the lifter movement.

Circle No. 11 on Postcard



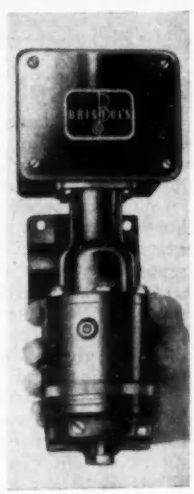
Shaft Seal

A new mechanical seal has been announced by the Crane Packing Company. Known as the "John Crane" Type 19, the seal is said to provide lifetime performance in small pumps, hot water circulators and many other rotary shaft applications. Special beveled cones made of Teflon (DuPont trademark for tetrafluoroethylene resin) are utilized as the flexible member. A packaged type unit, the seal provides easy installation for production assembly and replacement service and is available in sizes to fit shaft diameters of ¼, ⅜, ½, ⅝ and ¾ inches. The metallurgy of the seal can be specified to meet service requirements or operating conditions.

Circle No. 12 on Postcard

Pneumatic Transmitter

A miniature pneumatic transmitter for measuring and transmitting readings of temperature, pressure, vacuum, differential pressure and liquid level to recording, indicating, and controlling receivers, including miniature type receivers, has been announced by The Bristol Company. Transmission is by means of air pressures of between 3 and 15 pounds per square inch that have a direct relation to the measured quantity. This new type transmitter, known as the Bristol Series 650 pneumatic transmitter, uses standard Bristol measuring elements and a simple transmitting mechanism with only one pivot and no flexures. Weighing 7½ pounds, the transmitter is weatherproof and can be installed in any location.



Circle No. 13 on Postcard

Save time! Keep informed! Circle numbers on postcard, page 257

Radiotelephone Equipment

Fisher Research Laboratory, Inc., has announced its 1953 line of radiotelephone equipment. With units varying in power from 10 to 250 watts, this equipment is designed for reliable communication for all phases of petroleum exploration. These units are designed especially for use on drilling barges, by exploration parties and service crews. Units are available for ship-to-ship, ship-to-shore and land installations. Fisher direction-finding equipment can be supplied and used in conjunction with the standard Fisher radiotelephone units.

Circle No. 14 on Postcard

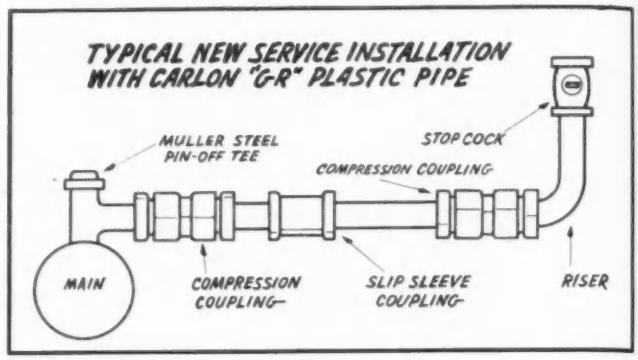
Splashproof Motor

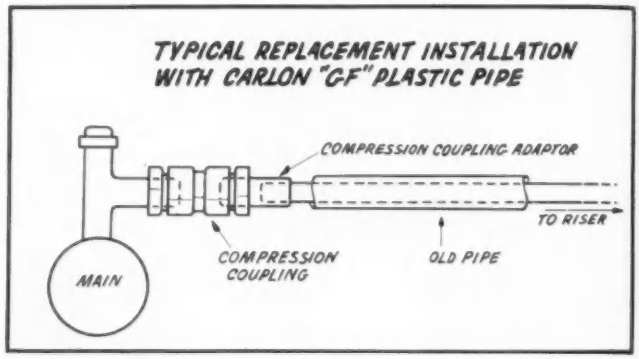
Specifically designed for installation out-of-doors, the Elliott Company's splashproof motor of latest design culminates more than seven years of experiment, test and development work. Its enclosure excludes moisture and dirt from the motor interior, even under the severe operating conditions imposed by dust storms, salt spray, blizzard or downpour. Features of the Elliott motor which make possible successful outdoor operation are the screened horizontal air inlets giving through passage for high winds, rains, and snow; multiple baffles for most efficient removal of moisture and air-borne dirt; and large air filter area above the water-separation chambers, giving maximum cleaning effectiveness. The Elliott outdoor-splashproof motor frequently makes it possible to eliminate costly buildings or housings, permitting both motor and drive to operate safely outdoors. No special foundation nor ventilating ductwork is required.

Circle No. 15 on Postcard

Plastic Pipe

Carlon Products Corporation has announced the development and production of two new types of plastic pipe for the installation of new gas service lines and the replacement of old corroded metallic ones. Both types have guaranteed corrosion resistance, greater carrying capacity, elimination of interior build-up, light weight, rapid and easy handling, faster connection, elimination of electrolysis and excellent strength and durability. Carlon GR pipe for new gas service lines has impact strength well in excess of the recommended requirements of the gas industry and has effective fiber stress of over 3600 pounds per square inch. Because the pipe is manufactured from an inert material, electrolytic corrosion is not possible. This pipe permits fast low cost installation. Produced from the same corrosion-resisting material as GR, Carlon GF flexible plastic pipe facilitates rapid and low cost replacement installations. It is inserted directly into the old corroded service line and will supply a comparable volume to the meter. It features the same mechanical, thermal, electrical and chemical values as the rigid pipe.





Circle No. 16 on Postcard

Reversible Tong Die

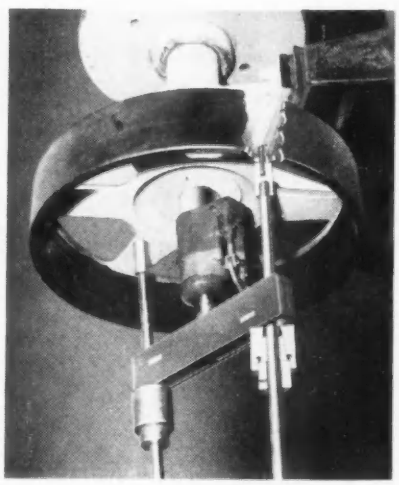
Woolley Tool Service of Odessa, Texas, has developed a reversible tong die called the "Stagger Tooth." The "Stagger Tooth" die wears one and a half to two times as long under actual field conditions, and is designed and processed to reduce flaking to the minimum. The die eliminates longitudinal scoring because teeth are offset and never get into a rut.

Circle No. 17 on Postcard

Oil Pump

A new heavy duty high pressure oil pump has been introduced by the Curtiss-Wright Corporation, marking the corporation's entry into the petroleum industrial equipment manufacturing field. The new pump has been field tested and approved by several leading oil companies for crude oil gathering service and product pipe lines. Its general industrial potential for pumping petroleum products and liquids is indicated by its use by leading government and private research laboratories. Of the rotary positive displacement type, the new pump is compact in design and is reversible.

Circle No. 18 on Postcard



Hub Puller Set

The new heavy-duty hub puller set made by Baird Manufacturing Company is designed for pulling hubs and any type of sprocket on drilling rig drawworks. This set can be used with any type of jack, hydraulic or otherwise. Adapters are made for holes from one-half to one-inch and are made of 4140 high tensile steel.

Circle No. 19 on Postcard

Save time! Keep informed! Circle numbers on postcard, page 257

Have you Observed

how many operators have standardized on GEOLOGRAPH?

Many decisions have to be made on the well while drilling. Geograph's easily read charts show drilling breaks, connections, trips and down time. Eliminates depth corrections. Improves accuracy of samples. No wonder so many operators depend on Geograph for accurate mechanical well logging.

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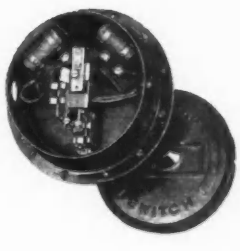
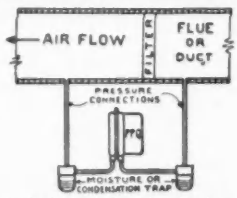
CONTROL FROM MINUTE CHANGES IN THE RELATIONSHIP OF TWO PRESSURES





Illustrated above is a standard application whereby the Type PPQ functions to open (or close) an electrical circuit from a variation in pressure differential due to a clogging filter.

Mercoid Type PPQ Diaphragm Differential Pressure Controls operate from minute changes (.03" water) in the difference between two pressures.

Ranges to cover most applications (inches of water) 6" vacuum to 6" pressure, and 30" vacuum to 30" pressure. Available for various circuit arrangements.

Electrical Capacity—0.3Amp. at 115V., A.C. or 0.15 Amp., at 230V., D.C. Can be furnished in explosion-proof or weather-proof cases.

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NOW AVAILABLE!
No. 2 ⅛" to 2"—1 wheel $ 9.85
No. 2X ⅛" to 2"—3 wheel $10.45
No. 4 2" to 4"—1 wheel $33.00
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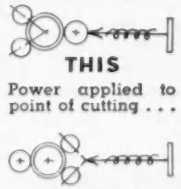
PAT.

BEAVER *presents . . .*
2 new and better pipe cutters
EASIER CUTTING . . . because the pressure is applied directly to the wheel

- Follows sound engineering principle. Feeds cutter directly into the pipe. Cutting is faster, easier, with less effort!
- Streamlined, balanced shape fits hand perfectly for easier operation!
- Rugged but light. Tough and long-wearing, oven-dried, smooth, baked lacquer finish!



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Power applied to point of cutting . . .

NOT THIS
Feeding rollers into work divides power, sets up wedging action . . .

For Better Pipe Tools . . . Buy
BEAVER
254-300 DANA AVE. WARREN, OHIO

New Catalogs and Equipment Literature

Pipe Line Filter

Four new low-pressure pipe line filter models are illustrated in a recently-released bulletin of the Dollinger Corporation. Specifications, engineering and performance data covering this new type filter recommended for the removal of dust, dirt, pipe scale, condensed oil, and water vapor from compressed air lines are included in the publication.

Circle No. 20 on Postcard

Pump Anchors

The Guiberson Corporation has released a brochure describing the Guiberson hydraulic pump anchors which cut pumping costs three ways. Engineering data and price lists, as well as general operating instructions are outlined for Type O and Type H-2 anchors. Type O is for anchoring parallel strings in "free pump" installations and Type H-2 is for anchoring conventional rod pumps.

Circle No. 21 on Postcard

Instrumentation Data Sheet

Honeywell instrumentation data sheet number 4.4-5 describes the Drever ammonia dissociator unit with integral Brown controller which automatically produces controlled atmosphere for heat treating and other applications where an inert atmosphere is required. Operation of the unit is from liquid bottled ammonia and production of nitrogen-hydrogen atmospheres from this source is greatly less expensive than from these bottled gases. The data sheet describes this unit produced by Drever Corporation.

Circle No. 22 on Postcard

Pipe Line Procedure

Caterpillar Tractor Company has issued a booklet, "Pipeline to Profit," explaining by pictures and captions the various steps in a pipe line project. The photographs are of actual pipelaying operations.

Circle No. 23 on Postcard

Self-Cleaning Strainer

S. P. Kinney Engineers, Inc., has for distribution a new 12-page booklet containing complete descriptions, illustrations, diagrams, and pertinent engineering data regarding the Brassert automatic self-cleaning strainer, the Kinney automatic self-cleaning strainer and the Kinney manually-operated self-cleaning strainer. These strainers are constructed in 2-inch to 36-inch pipe line sizes and will remove fine suspended particles from raw or process water, oil, gasoline, alcohol, ammoniacal liquor and other liquids. The product is applicable for use in steel mills, metropolitan filtration systems, chemical plants, paper and pulp mills and other types of industries.

Circle No. 24 on Postcard

Air Pressure Dispenser

A bulletin describing a new air pressure operated dispenser is available from Oil-Rite Corporation. The dispensers described are furnished in sizes up to two gallons in capacity for floor or wall mounting and the oil supply is always visible through the transparent reservoir, showing at a glance when a refill is necessary. Drawings of the operation of the dispenser and a capacity table of different models are included in the bulletin.

Circle No. 25 on Postcard

Radiotelephone Equipment

All mobile radiotelephone equipment manufactured by Kaar Engineering Corp. is included in a new catalog. Kaar manufactures mobile equipment and station equipment for use in the 152-174 MC band, the 25-50 MC band, and the 1600-6000 KC band. In addition, the complete line of Kaar accessories is included in the catalog.

Circle No. 26 on Postcard

Plastic Pipe

To aid pipe users faced with the problem of corrosion, the Anesite Company has issued a folder describing the company's plastic pipe known as Black Buty. Included in the literature are specifications from ½-inch to 6-inch diameters, estimated working pressures, data on chemical resistance, fittings available, and typical applications.

Circle No. 27 on Postcard

Ram Tubing Head

The National Supply Company has released a bulletin describing National's Type C ram tubing head. Cutaway views show features of the ram-type head including easy insert replacement, secondary emergency seal, scavenged movement areas, full opening bodies, sealed in steel, roller thrust bearings, visible centering index, and stainless steel stems.

Circle No. 28 on Postcard

Diesel Electric Sets

A detailed description of five Caterpillar diesel electric sets is contained in "Diesel Electric Sets," a new booklet published by Caterpillar Tractor Co. The booklet, containing 50 illustrations, points up the ability, reliability, adaptability, durability, portability and economy of these five models—D17000, D13000, D8800, D318, D315 and D311. Detailed description is given of the fuel, lubrication and cooling systems of these units, advantages of several important parts in these electric sets; self-regulated generators and the completely automatic standby electric sets. Specifications of all models are given.

Circle No. 29 on Postcard

Water Softening

A new bulletin on the principles and details of zeolite water softening has been prepared by the Technical Department of Graver Water Conditioning Company. The bulletin explains the distinction between the sodium cycle and the hydrogen cycle of zeolite softening and graphically shows the differences in results obtained by the two processes. This discussion is followed by a description of the design and operation of equipment used in zeolite water softening and available methods for controlling the various operations in the softening and regenerating processes.

Circle No. 30 on Postcard

Pumping Units

A bulletin describing a complete series of adjustable crank pumping units is available from Cabot Shops. The manufacturer announces this A C series has been field tested for more than two years and incorporates the best features of other Cabot units with a new adjustable crank balance. The new crank eliminates heavy lifing, complicated tools, and makes weight adjustment an easy one-man job. The complete series ranges in size from 11,000 to 32,000 pounds minimum polish rod load. Cabot pumping units are distributed exclusively by Jones and Laughlin Supply Company.

Circle No. 31 on Postcard

Engineering Bulletin

A new general bulletin just released by The Cooper-Bessemer Corporation provides complete data and specifications of Cooper-Bessemer four-cycle Type LS engines of 15½-inch bore and 22-inch stroke. Engines are operated by gas, gas-diesel and diesel, atmospheric or supercharged and are rated from 690 to 2500 horsepower.

Circle No. 32 on Postcard

Save time! Keep informed! Circle numbers on postcard, page 257

National Supply Bulletins

The new Ideal micromatic drilling control, the Ideal Type A over-running clutch and Ideal Type C-350 Power slush pump are described in three bulletins released recently by The National Supply Company. Features of the micromatic drilling control and operating details and advantages of a safe precision feed-off for drilling rigs are described in Bulletin 388. Likewise, features of design and operation of the other two products are evaluated in bulletins 386 and 389.

Circle No. 33 on Postcard

Maintenance Guide

Caterpillar Tractor Company has produced another in a series of cartoon-type instruction booklets for its equipment. The latest publication is "Maintenance Guide" which illustrates the proper operation and care required for Caterpillar's four large V-type engines, the D397, D386, D375 and D364. The 24-page booklet starts showing a Caterpillar representative talking with municipal officials about the electric sets just installed in the town's power plant. The Caterpillar representative gives detailed instruction for proper maintenance of these engines, using diagrams and illustrations.

Circle No. 34 on Postcard

Stainless Steel Wire

A new 20-page booklet of technical data on the application of stainless steel wire has been published by Allegheny Ludlum Steel Corporation. Nearly all grades of Allegheny metal are now available in wire form. Tables of physical properties, corrosion resistance and analysis are included to help the reader in considering the various types. A discussion of the principal uses of stainless wire covers cold heading, weaving, heat resisting belts, rope, spring wire, slide forming, welding and winding.

Circle No. 35 on Postcard

Metal Hose Data Book

Designed to give information to both the engineers and purchasing agents, a technical data book has been prepared by Universal Metal Hose Company. Types of Universal flexible metal hose are illustrated and information is given on application and temperature ranges of types of metal and wire braided hose, dimensions, couplings and assemblies.

Circle No. 36 on Postcard

Industrial Controls

Catalog 8305 of Minneapolis-Honeywell Regulator Company illustrates non-indicating electric, electronic and pneumatic controllers for temperature, pressure and humidity, also pneumatic and electric valves, switches and relays. Specifications, dimension drawings, application data and ordering information are included.

Circle No. 37 on Postcard

HANDLE A THREE-TON LOAD

With One Hand In Your Pocket...

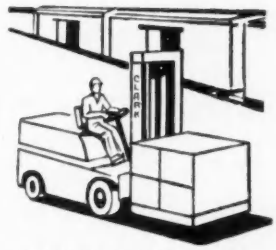
Use CLARK *POWRWORKERS!*

CAN'T YOU JUST PICTURE THIS MAN trying to pull this load with an old-fashioned manual hand truck! It's a cinch he wouldn't have a smile on his face—there'd be sweat and strain, because those transmission housings weigh pretty near three tons!

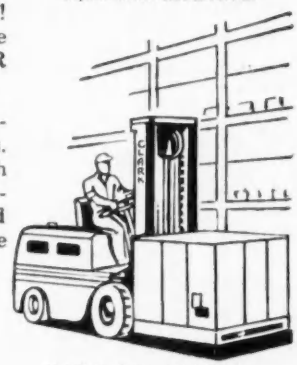
As a matter of fact, his boss is even happier. That POWRWORKER pallet truck has taken the muscle work out of the job, turned a tired worker into the smiling chap you see here. Furthermore, this employee is now doing twice the work he accomplished manually. No labor problem here! And the boss gets more effective use of his storage space, because the compact little POWRWORKER thrives on narrow aisles and low-load floors.

Not to mention the fact that the POWRWORKER is tailor-made for tight budgets. Big-truck benefits at small-truck cost — which means that nobody need deny himself the money-saving advantages of mechanized handling. Pound for pound, dollar for dollar, you can't beat the value in CLARK'S POWRWORKER Line.

Get the facts from your nearby CLARK Dealer (look under "Trucks Industrial", in the Yellow Pages of your phone book) or use the coupon below.



CLARK Electric Powered Fork Trucks: Capacities from 1000 to 7000 lb.



CLARK Gas Powered Fork Trucks: Capacities from 1000 to 15,000 lb.

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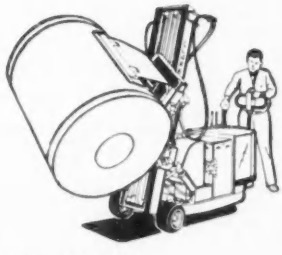

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WELL LOGGING—Brochure and References. Geological Well Service Co. See page 300.
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ROTARY AND CABLE TOOL DRILLING LINES—Information. Jones & Laughlin Steel Corp., Supply Division. See page 43.
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WIRE ROPE—G-15 Handbook. Macwhyte Company. See page 12.
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PISTON RODS, PISTON ROD LOCK NUTS AND PISTON PULLERS—Catalogs Nos. P-101, P-102 and P-106. Oil Well Manufacturing Corp. See page 295.
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TUBING ANCHOR—Information. Page Oil Tools, Inc. See page 189.
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CASING AND TUBING—Literature. Republic Steel Corp. See page 23.
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PRESSURE CONTROL EQUIPMENT AND FISHING TOOLS—Information. Shaffer Tool Works. See page 45.
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JACKS—Catalog. Templeton, Kenly & Co. See page 300.
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SHOT HOLE RIG—Literature. Texas Instruments, Inc. See page 36.
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HANDBOOK OF WIRE ROPE FOR WELL DRILLING—Union Wire Rope Corp. See page 293.
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PIPE COUPLINGS, FITTINGS AND GROOVING TOOLS—Catalog-Manuals Nos. 44-81. Victaulic Company of America. See page 170.
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GAS POWER UNITS—Bulletin 1079. Waukesha Motor Co. See page 13.
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RIGS—Catalog. Wilson Manufacturing Co. See page 133.
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What's Happening

AMONG MEN IN THE INDUSTRY

Paul R. Schultz, Stanolind Oil & Gas Company, has been named assistant to the executive vice president, **A. L. Solliday.** Formerly manager of the Economics department, Schultz assumed his new duties June 1. Schultz went to Tulsa from Chicago in 1946 as chief chemical engineer for Stanolind, and became manager of the Economics department in 1947. A chemical engineering graduate from Illinois Institute of Technology, Schultz received his M.S. from Case School of Applied Science.

Paul R. Schultz

•

Steven H. Harris and **James L. Brown,** consulting geologists, have opened new offices in the Petroleum Building, Bismarck, N. D.

•

J. R. MacGregor has been appointed to the newly-created post of research coordinator, Petroleum Products, with the California Research Corporation in San Francisco. MacGregor, a graduate of the University of California, joined Standard Oil Company of California, parent company of Cal Research, in 1925 and has been associated with the research subsidiary since it was established in 1944.

•

George E. Martin has been appointed manager of the Los Angeles regional personnel office of Standard Oil Company of California. Martin succeeds **Barton Cater** who retired, having been with the company since 1925. Martin, previously manager of the company's regional personnel office at Taft, joined the firm in 1922. He will be succeeded by **F. M. Russell,** assistant to the manager of the Safety Division of the Personnel department in San Francisco.

•

J. T. Clark has been appointed district geologist for Phillips Petroleum Company at Amarillo, Texas. Clark will be in charge of the geological section of the land and Geological department's Amarillo office. Recently Clark has been attached to the northeast division office at Bartlesville, Okla., as assistant division geologist.

•

Z. E. Stucky has been named assistant to the chief geologist of Cities Service Oil Company (Del.). Formerly Stucky was regional geologist for the Northwest division.

•

Harry Ames, formerly an independent operator in the Illinois Basin area, has joined Keystone Oil Company at Oklahoma City as general manager.

•

W. G. Harris has resigned as geologist for Oil Management and is now a consultant at Carmi, Ill.

David T. Staples, a director of Tide Water Associated Oil Company and executive vice president and director of Pacific Western Oil Corporation, was elected president of Tide Water at the organization meeting of the directors. Other company changes announced included the retirement of **William F. Humphrey** as president and director, and the retirement of **U. B. Boucke,** vice president, director and controller of the company, who resigned from the first two positions but remains as vice president. **Fero Williams,** re-elected a director, was elected vice president and controller. **Herbert S. Chase,** director and vice president, retired as director but continues as vice president—manufacturing in the eastern division.

•

J. O. Richardson has been advanced to the position of chief petroleum engineer for the Hancock Oil Company. Richardson was graduated from the University of Southern California in 1942 and received his M.S. in 1946. During the past eight years Richardson has worked as a petroleum engineer on the West Coast and spent one year in Canada.

•

Paul T. Seashore will retire as director and first vice president of The Louisiana Land and Exploration Company. To fill the vacancy on the board of directors **Burton A. Hardey** of Shreveport, La., has been elected a director. **Owen F. Thornton,** vice president, will become the senior officer in charge of operations. Seashore joined the company in 1927 and has served as director, vice president and general manager since 1931. He will continue to serve as a consultant to the company.

•

S. Cassell Barrett has resigned from Stanolind Oil & Gas Company, Tulsa, and is now with Colorado Interstate Gas Company at Colorado Springs, Colo., as manager of gas sales.

•

Richard Steinhorst, Jr., has been appointed assistant to the general superintendent of production of The British-American Oil Producing Company with offices at the company's Dallas headquarters. From 1937 until his appointment by British-American, Steinhorst was employed by The Texas Company. From December, 1944, to August, 1948, he was district petroleum engineer—Illinois Basin and in 1948 he became assistant district superintendent—Illinois Basin.

R. Steinhorst, Jr.

•

J. P. Engle, formerly assistant purchasing agent for Sinclair Oil Corporation in Houston, has been named purchasing agent of Sinclair Oil and Gas Company of Tulsa succeeding **H. A. Woodard** of Tulsa who retired. **R. D. Troutman** succeeds Engle in Houston.

Willard K. White has become associated with Byrd Oil Corporation, Dallas, where he will handle title work and other legal work pertaining to oil and gas law. From 1947 White was a practicing attorney in the firm of White & White, Cisco, Texas, representing independent oil operators in the West Central Texas District.

•

William Wallace Mein, Jr., vice president of Bishop Oil Company since 1943, has been elected president of the company and **Edwin J. Valencia,** company treasurer and member of the board of directors, was named a vice president. The board of directors elected **William Wallace Mein,** founder and retiring president, to the newly-created position of chairman of the board.

•

Dr. K. C. Heald, vice president of Gulf Oil Corporation—world-wide exploration and production and a director of the company, has retired from active service but continues to carry on certain consulting work. Heald is a holder of the Sidnew Powers Memorial Medal awarded by the American Association of Petroleum Geologists. He joined Gulf as chief staff geologist in 1925, was elected a vice president in 1945 and placed in charge of the company's exploration and production activities in the United States and Canada. In 1950 Heald was elected to the board and made responsible for the company's world-wide exploration and production activities. Before joining Gulf, Heald was with the United States Geological Survey and was an associate professor of geology at Yale University, where he did his graduate work. **Ralph O. Rhoades,** a vice president of Gulf Oil Corporation since 1951, has been placed in charge of the company's world-wide exploration and production activities succeeding Dr. Heald.

Dr. K. C. Heald

•

New officers and directors of Dominion Natural Gas Company, Limited, who were elected recently are **H. L. Rudolph,** vice president and director, **D. P. Spencer,** treasurer; and **R. M. Robinson,** secretary. Spencer was elected treasurer of the company. Rudolph has been connected with Cities Service Company subsidiaries since 1936 and with the Dominion-Republic-Penn-York group for the past ten years. Spencer has been in employment with Cities Service subsidiaries for the past 34 years. He has been secretary of Dominion and Republic since 1947 and will continue as secretary of Republic. D. A. Hamilton resigned as treasurer of Republic and Dominion and will join another Cities Service Company subsidiary, Arkansas Fuel Oil Corporation with head offices in Shreveport, La.

Chester U. Burk of Oklahoma City, mechanical engineer for the central region of Continental Oil Company's Production department, has been promoted to the newly-created position of supervising mechanical engineer for the company's Production department with headquarters in Houston. **M. L. Sweeney,** Ponca City, Okla., production clerk, has been promoted to the newly-created position of director of methods analysis for the company's Production department. He will continue to make his headquarters in Ponca City.

•

Theadore N. Law, Jr. has been appointed director of employee and industrial relations of the Falcon Seaboard Drilling Company with offices in Tulsa. Law, whose father, T. N. Law, is president of Falcon-Seaboard, studied at the University of Kansas and Tulsa University and worked on rigs in Oklahoma and Colorado.

•

D. B. Edwards, former chief plant engineer for Stanolind Oil and Gas Company, has been appointed assistant sales superintendent. **R. L. Marek,** former superintendent of crude oil sales, was appointed gas sales superintendent to succeed **S. C. Barrett,** who recently resigned. **E. W. Kilgren,** gas development supervisor was promoted to chief plant engineer.

•

John O. Campbell, Jr., has been named head of the natural gas and gas products section in the Crude Oil Purchasing department of The Carter Oil Company with headquarters in Tulsa.

Silas C. (Buzz) Brown has resigned as district geologist for General Petroleum Corporation in the Four Corners area to establish himself as an independent consulting geologist. Brown shares an office in the Jeffrey Building in Durango, Colo., with **James E. Mavor,** petroleum engineer, and **Walter J. Osterhoudt,** consulting geophysicist, and will continue to make his home in Durango. A graduate of the University of Kansas, Brown went to Colombia, South America, for Socony-Vacuum Oil Corporation in 1940. Later he worked for the U. S. Geological Survey before serving in the U. S. Navy. After work in Arizona for the U. S. Geological Survey in 1946 and 1947, he did consulting work in northern Arizona until he joined General Petroleum Corporation in 1948. Brown will specialize in the exploration for oil, gas and uranium in Colorado, Utah, Arizona and northern New Mexico.

Silas C. (Buzz) Brown

•

Five key administrative positions have been established by The Carter Oil Company, Tulsa, and the following appointments announced: **A. R. West,** Tulsa, manager of the southern division, Shreveport, La., with **R. W. Beck,** Shreveport, and **H. R. Shannon,** Denver, Colo., as exploration and production managers; **O. D. Harper,** Mattoon, Ill., manager of the eastern division with headquarters at Mattoon; **R. W. Gemmer,** Billings, Mont., manager of the northern division at Billings, with **L. C. Lamar,** Tulsa, as exploration manager; **Dr. J. H. Mullane,** Tulsa, manager of the central division at Oklahoma City; **George E. Wagnoner,** Shreveport, manager of the western division at Denver with **R. D. Sloan** continuing as division exploration manager and **R. S. Frazier** becoming division production manager.

•

S. K. Clark, Houston, manager of Continental Oil Company's Royalty department, has been given the additional responsibility of manager of the company's Foreign department. In his new assignment Clark will work closely with Hudson's Bay Oil & Gas Company, Ltd. and Conorado Petroleum Corp., Conoco affiliates.

•

Robert H. Love has been transferred from Lion Oil Company's Wichita production and exploration office to Great Bend, Kansas, where he continues his work as a landman for the company. Love joined Lion Oil's Wichita office in May, 1952 as a scout and was promoted to landman in December.

•

Gail A. Barry, 36, has resigned his position as petroleum geologist with William H. Spice, Jr., petroleum consulting firm in San Antonio, Texas, to join Paul J. Moore, petroleum consultant, as a partner. The new firm will be known as Barry and Moore, Petroleum Consultants, and will maintain offices in the Alamo National Building, San Antonio. After graduation from The University of Texas in 1940, Barry joined Petty Geophysical Engineering Co. He has been with William H. Spice for the past nine years.

THE ROYAL'S

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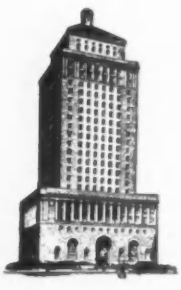

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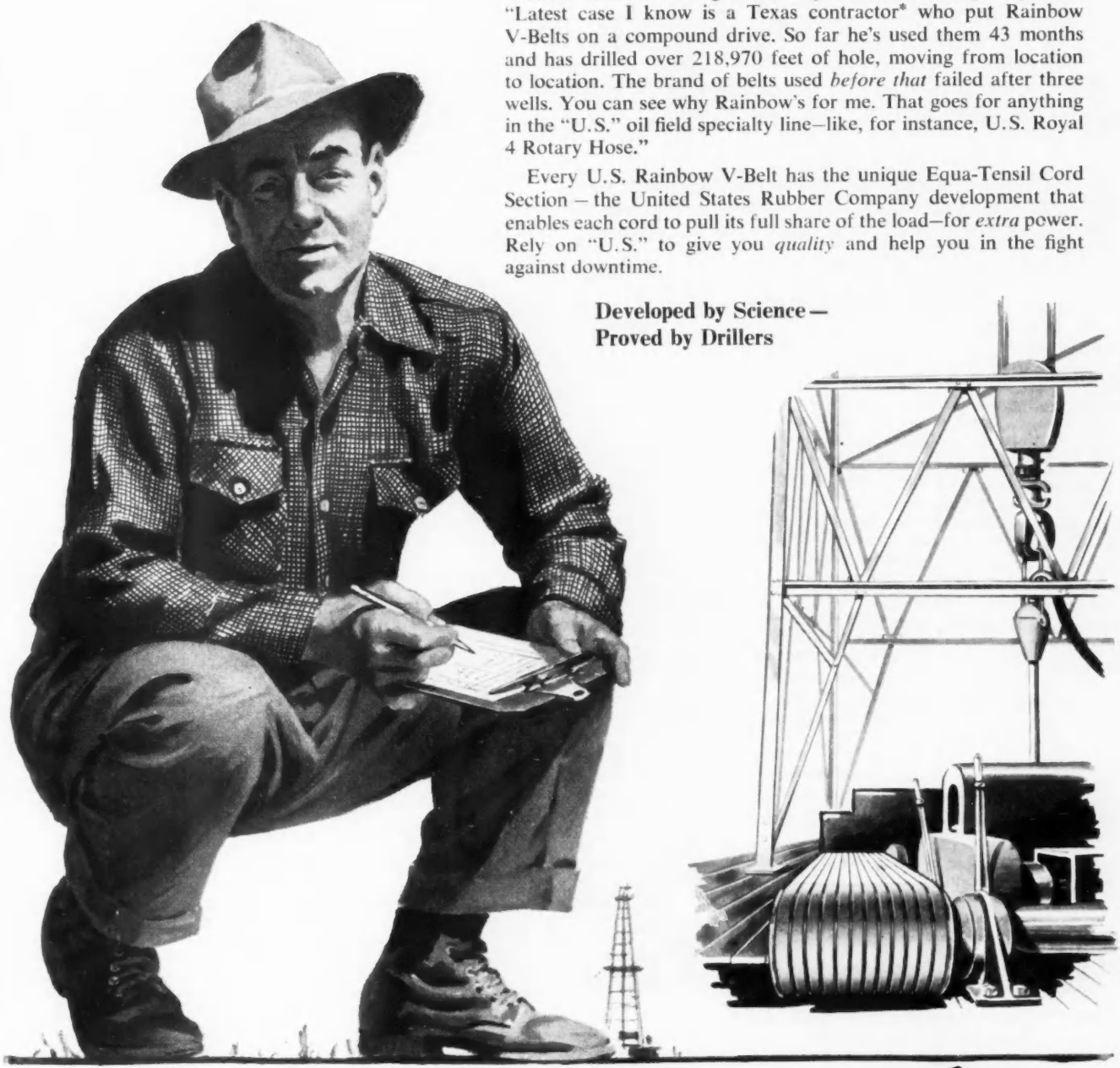

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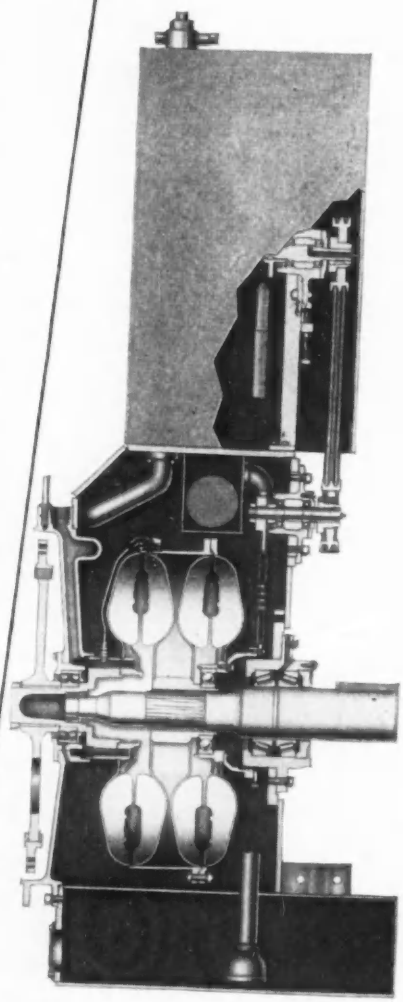
For complete information on how Twin Disc Disconnecting Hydraulic Power Take-Offs are adding efficiency to modern drilling rigs, contact your nearest Twin Disc Factory Branch, or write to the Hydraulic Division, Rockford, Ill.



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E. P. (Gene) Neal, Tulsa, has joined Toklan Royalty Corporation and its affiliated companies as chief geologist and director of exploration. Neal is well known in the Mid-Continent area, having been employed for 13 years by Shell Oil Company. Neal left Shell in 1937 to join the Geological department of Tide Water Associated Oil Company. From 1944 to 1947 he served as district geologist in Wichita, Kansas, and was transferred to Tulsa as regional geologist for the Tulsa district.

E. P. (Gene) Neal

•

H. E. Zoller, Jr., has resigned from the Skiles Oil Company at Sterling, Colo., and is now associated with W. H. Pattison, Oklahoma City independent.

•

Herschel L. Driver has been appointed senior staff geologist with the Exploration department of Standard Oil Company of California. He will make his headquarters in San Francisco. Driver, who joined Standard in 1925, has been the company's staff stratigrapher, covering the Pacific Coast from Los Angeles.

•

W. D. Lewis, former district geologist in the San Joaquin Valley for General Petroleum Corporation, has been appointed manager of lands and exploration for Bysshe and Barratt, Los Angeles operators. Lewis, who will have headquarters in Bakersfield, Calif., received his B.A. degree at Denison University, Granville, Ohio, and his M.S. degree from California Institute of Technology.

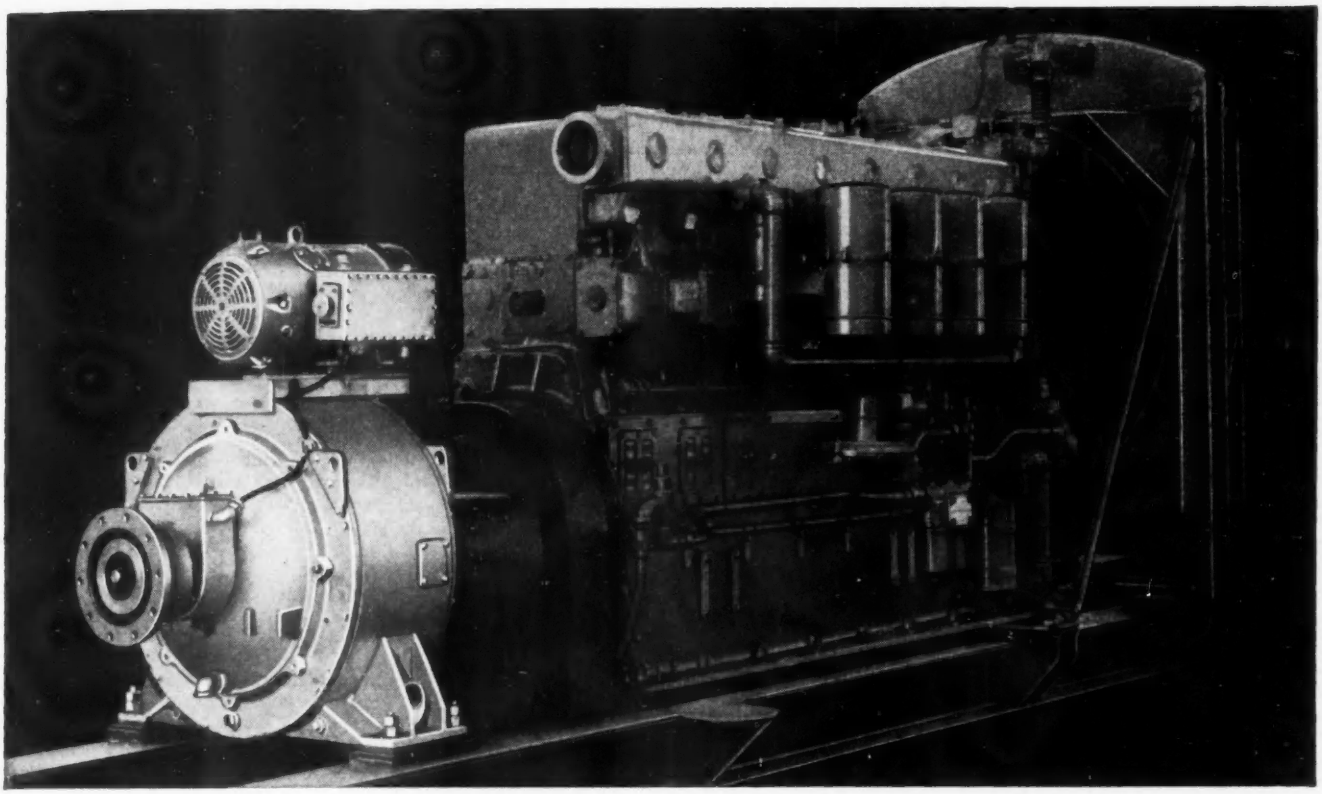
•

A. W. Tarkington, Oklahoma City, vice president and central region general manager of Continental Oil Company, has been appointed southwestern region general manager with headquarters at Fort Worth, Texas. Tarkington succeeds **H. H. Hinson,** Houston, who recently was elected vice president exploration. **K. W. Brill,** Houston, assistant general manager of Conoco's southern region, has been named to succeed Tarkington as central region general manager with headquarters at Oklahoma City.

•

Charles W. Lane has been appointed chief geologist of Falcon Seaboard Drilling Company and will have charge of all geological activity in the Mid-Continent area with special emphasis in Oklahoma and Colorado. Lane gained his business and geological experience with Indian Territory Illuminating Company, Delmar Oil Company, The Pure Oil Company, and recently was a geologist with Deep Rock Oil Corporation in Tulsa.

Charles W. Lane



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Ajusto-Spedes • Shovel Clutches • Press Drives • Lift Truck Clutches • Electronic Controls

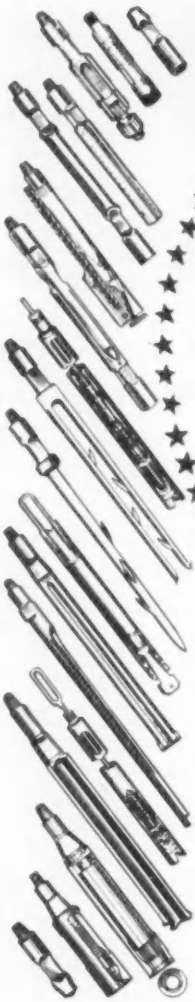
D. A. Young has been elected president and chief executive officer of the newly-organized Sinclair Crude Oil Company, a wholly owned subsidiary of Sinclair Oil Corporation which was organized to expand Sinclair's activities in the purchase and sale of crude oil. **Alexander Johnston** will be chairman of the board and **W. C. Rhodes** and **Frank D. Gardner** were elected vice presidents. Headquarters of the new company will be in the Sinclair Building, Tulsa.

D. A. Young

Carl L. Ritter, Houston, has been promoted from assistant director to director of Continental Oil Company's natural gasoline and gas division. Ritter succeeds **J. R. Bailey**, who resigned to accept a position with the Mene Grande Oil Company in Venezuela, will make his headquarters in Houston. Ritter joined the company in 1935 and has served as foreman of the company's Billings, Okla., natural gasoline plant, assistant district superintendent at Tepetate, La., sales engineer for the Marketing department in Houston, superintendent of natural gasoline and gas operations in Ponca City, Okla., and assistant director of Conoco's Natural Gasoline and Gas division in Houston.

•

W. O. Keller and **L. F. Peterson**, petroleum consultants, have announced the removal of their offices from Midland, Texas, to Fort Worth, Texas.



YOUR U. S. A.

You've probably got mad because you couldn't find a place to park in your town to shop or go to the movies. Who hasn't beefed a little about the strings of cars along the curbs on both sides of residential streets? There just aren't enough garages in the land to hold them all. Nobody can blame us for scolding at times, but let's not take ourselves too seriously. We wouldn't change things if we could. *This* is just another proof that no other system in the world is equal to the *American free enterprise system* that produces for all in such abundance. We're the only people in the world who enjoy the privilege of cussing about our traffic problems.

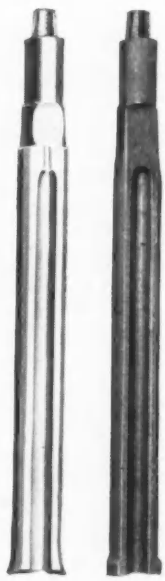
Let's continue to enjoy the privilege.

SPANG HEAT-TREATED DRILLING BITS

Spang Drilling Bits are forged by a patented process which assures a sound, homogeneous product. The steel is made to specifications, which have been developed out of a long experience, to give the maximum of footage per dressing.

In the heating and forging operations, the most modern methods are used. Each step is carefully planned and executed to produce sound forgings. Heat treatment by use of modern furnaces with heat-recording instruments and experienced personnel insures the maximum of joint strength. A field dressing instruction chart is yours for the asking.

Spang Drilling Bits reflect the skill and knowledge that make every Spang Cable Tool a "Higher Standard" product.



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The HIGHER STANDARD

SPECIFY SPANG–FOR SALE BY DEALERS EVERYWHERE

DEATHS

Harlan M. Ellis, 47, Lockheed Aircraft Corporation executive and onetime Yale University quarterback, died May 22 in Los Angeles. In the early 1930's Ellis was engaged in oil exploration in Texas for the Aston-Ellis Oil Company, of which he was part owner and superintendent of drilling. He joined Lockheed in 1951.

•

M. H. Haugh, 72, pioneer Oklahoma oil operator, died May 23 in a Nowata, Okla., hospital.

•

Clement Davis, 59-year-old Shawnee independent oil producer, died May 29 in Temple, Texas. Davis had been an independent oil producer and a Shawnee resident for 30 years.

•

Orville Palmer Callahan, 70, former Ponca City, Okla., mayor and former secretary of the old Marland Oil Company, died May 26 in Oklahoma City. Callahan was an employe of the Oklahoma Utilities Company at the time of his death.

•

Beman G. Dawes, 83, first president of The Pure Oil Company, died May 15 at his home in Licking County, Ohio, near Newark.

•

William D. Kennedy, 27, seismologist for Kerr-McGee Oil Industries Inc. of Oklahoma City, was killed in an automobile accident recently at Quinn, S. D. Funeral services were held at his home in Fort Smith, Ark.

•

Bernard B. Jones, 86, pioneer Oklahoma oil operator credited with bringing in the discovery well in the Cushing, Okla., pool, died May 7 at his home in Washington, D. C.

•

Chester A. Grady, 70, independent oil man, died May 9 in a Tulsa hospital. A native of Wichita, Kansas, Grady had operated out of Tulsa for about 40 years.

•

David S. Rike of Tulsa, retired pipe line superintendent for the former Sinclair Prairie Oil Company, died April 17 in Tulsa. Rike retired in 1942.

•

Edward Lee Roark, 54, independent consulting geologist, died at his home in Tulsa June 9. Formerly Roark worked for the old Marland Oil Company, the Winona Oil Company and other firms before becoming an independent five years ago.

•

William Charles Lambert, 74, retired oil field pumper, died at his home in Oilton, Okla., June 7. Before his retirement Lambert was a pumper for Nabob Oil & Gas Company, the Thlocco Oil Company, and Magnolia Petroleum Company.

•

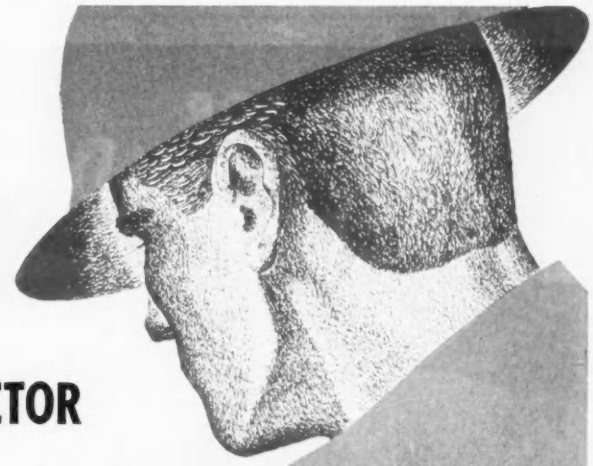
T. J. Fitch, 82, died at his home in Rogers, Ark., May 22. Fitch began working at the age of 17 for the National Transit Pipe Line Company and spent more than 44 years in the pipe line business. He joined Magnolia in 1911 and retired in 1938 as vice president, director and manager of pipe lines for Magnolia Pipe Line Company.

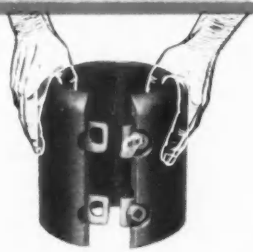
LOCK ON

VETCO

OFF-N-ON

DRILL PIPE AND CASING PROTECTOR





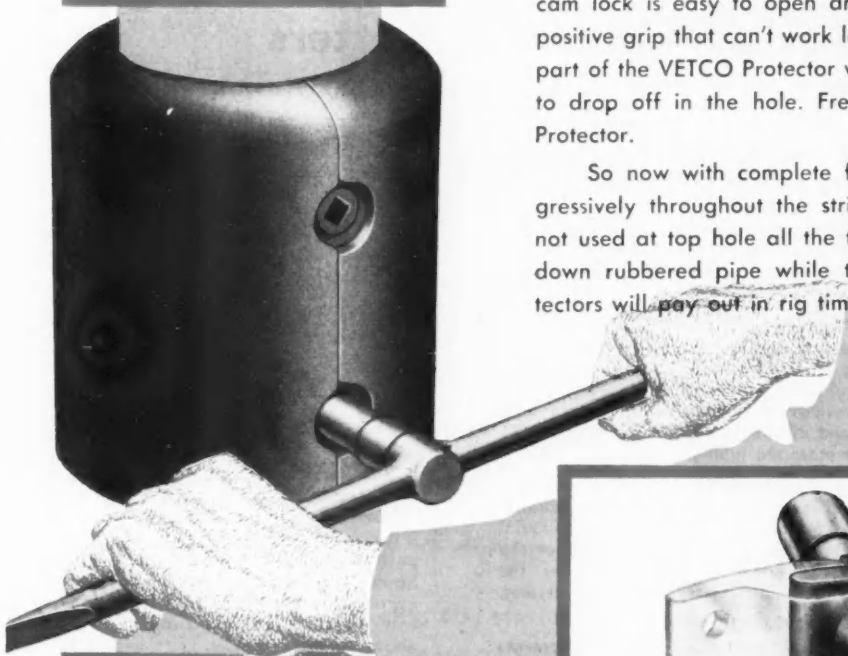
The VETCO is installed on the pipe. Cam locks are engaged easily by hand. And then are locked tightly by means of a "T" handle wrench which is the only tool needed.

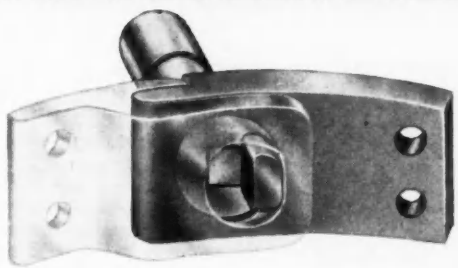
pays for itself in rig time saved...

VETCO Protectors go on and come off fast—8 to 10 seconds. With one quick motion you lock VETCO Protectors on the joint you want. You get complete flexibility and complete control with rubbers on only the joints you want. Your own crew puts Protectors on and off without waiting for a service crew.

The cam locks the Protector on with a tight grip that won't jar loose, can't slip, and won't move in any way. This cam lock is easy to open and to close; yet it closes with a positive grip that can't work loose. The cam lock is an integral part of the VETCO Protector with nothing to misplace, nothing to drop off in the hole. Frequent changes do not hurt the Protector.

So now with complete freedom you can use pipe progressively throughout the string. The same rubbered pipe is not used at top hole all the time. You no longer need to lay down rubbered pipe while tripping. VETCO Off-N-On Protectors will pay out in rig time saved.





The forged cam lock is built right into the VETCO Protector. Nothing to come loose and fall in the hole. Nothing can loosen the tight lock.

The alloy steel bands form a strong skeleton to grip the pipe. Rubber is compressed between the metal bands and the pipe for a tight grip which prevents movement of the protector.

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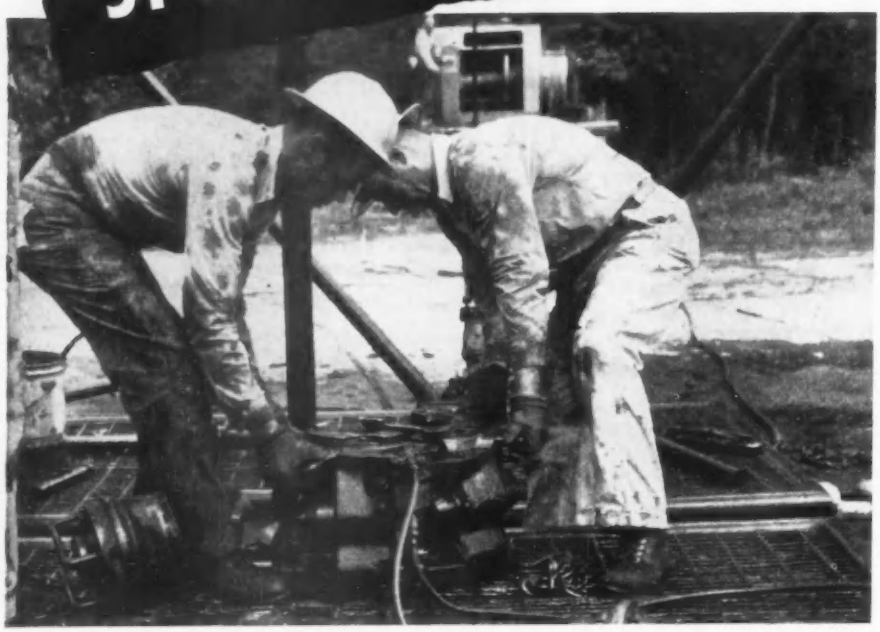
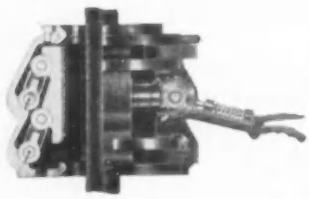
507 BRYAN STOCK TRAIL, CASPER, WYOMING — Phone: 5942

SET-UP FOR
SPEED AND SAFETY

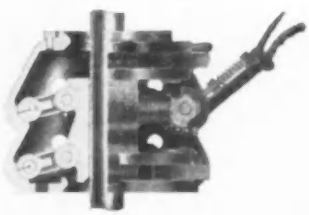


Shown above is the Kinzbach Spider with air operator attached.

KINZBACH AUTOMATIC TUBING SPIDER



Running in. Slip segments are fully retracted.



Slip Set. Note that slip segments are still parallel with the centerline of the pipe. Handle is locked in "closed" position.

KINZBACH TOOL CO INC

Positive Grip, Automatic Alignment, One-Man Operation, and Full Size Range are four reasons why Kinzbach Automatic Tubing Spiders are so fast and safe.

POSITIVE GRIP

Parallel linkages are used to control the slip segments, a design which makes pipe handling faster and safer than ever before. The parallel action provides a stronger grip than conventional wedges and will not permit the slip segments to gouge or score the tubing.

AUTOMATIC ALIGNMENT

The slip segments move at all times parallel with the tubing thus providing true radial closure. Provision is made at the end of the linkages to permit the adjustment of the segments to the tubing contour while closing.

ONE-MAN OPERATION

A single lever control actuates all segments at the same time and in the proper relation. The operator may reach the elevators while operating the Spider with one hand. If desired, the unit may be equipped with an air operator as shown above.

FULL SIZE RANGE

The Kinzbach Automatic Tubing Spider handles tubing through 3". It is rated at a 150,000 pound operating load.

The Spider Assembly is hinged and may be placed around the tubing without breaking a joint and may be used on well head fittings or adapted to fit a rotary bushing.

For complete information write for Bulletin 23151.

KINZBACH TOOL CO., INC.
P. O. BOX 277 HOUSTON 1, TEXAS
Export Office: 74 Trinity Place, New York, N. Y.

Robert Charles Smith, vice president of the Carl B. King Drilling Company of Texas, died May 8. Formerly Smith was with Technical Oil Tool Company, Reed Roller Bit Company and Loffland Bros. Drilling Company.

•

Sam Lewis, 64, an independent oil operator, died at Evansville, Ind., on May 24. Lewis was in business with his sons, Yale and Blakely Lewis, under the title of Sam Lewis and Sons.

•

Charles Cunningham, 80-year-old retired oil well driller, died June 3 in Sapulpa, Okla.

•

Carl V. Schlaet of Rancho Santa Fe, died recently. Schlaet, the son of one of the three founders of The Texas Oil Company, spent much of his life developing Mexican oil fields for the concern.

•

H. A. (Lon) Melat, 95, who devoted 58 years to the oil industry, died June 9 at his home in McAllen, Texas. Melat retired in 1933 from Gulf Oil Corporation for which he served as roustabout, gauger, pumper, and driller. At the time of his retirement he was superintendent of production.

Letters

• They agree

"We have read with great interest your editorial in the May 1953 issue of WORLD OIL entitled 'Water-Flooding Like Wildcatting.' We have been in the engineering end of the water-flooding business for some years and your editorial expresses exactly what we have been trying to impress upon the industry."

—David Scott, Jr.
Ryder Scott Company
Bradford, Pa.

• Try A-bombs?

The article appearing on page 48 of the June issue of WORLD OIL by Messrs. Reese and Spann gives a most illuminating description of the formation, pathway and results of tropical storms. Since the formation of such storms is so graphically presented, the suggestion comes forth that something might be done about them.

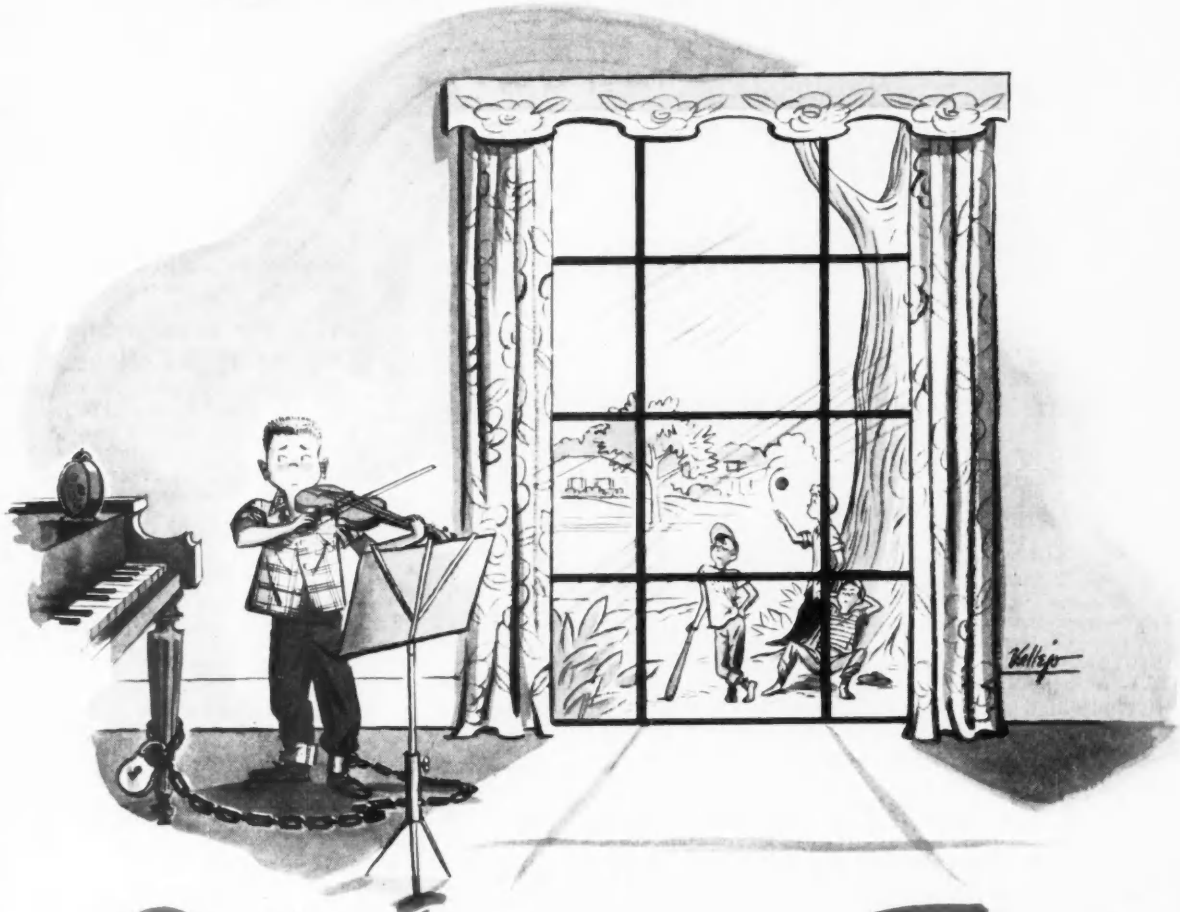
With the current publicity in respect to "atomic bombs"—otherwise known as nuclear fission, it might be worth while to try some of such bombs on the earlier phases of the storm development. The endeavor might be facilitated by the use of nuclear missiles.

Since the article describes the contact of warm, dense atmosphere with the upper stratas of cold atmosphere, the suggestion comes forth that, with the heat of nuclear fission, the storm might in a sense be headed off before it reached damaging proportions.

My apologies are offered for asking your attention to this matter.

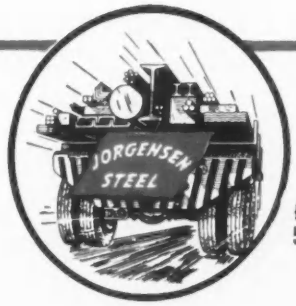
—C. H. Beck
Pacific Electric Bldg.
Los Angeles, Calif.

Steel Problems?



Call Jorgensen First

If a steel problem has you playing the blues, look to Jorgensen for the key. You can't lose with the Jorgensen experts on your team. They know all about steel and can supply it right now from complete stocks of carbon, alloy, stainless, tool and specialty steels. So don't fiddle around with a steel problem—*CALL JORGENSEN FIRST!*



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What's Happening

AMONG INDUSTRY ASSOCIATIONS

Tulsa Geophysical Society Announces New Officers

Norman H. Ricker, senior geophysicist for The Carter Oil Company, has been elected president of the Geophysical Society of Tulsa. Other officers named are John M. Crawford, Continental Oil Company, Ponca City, Texas, first vice president; R. W. Mossman, Seismograph Service Corporation, Tulsa, second vice president; Tom F. Southgate, Amerada Petroleum Corporation, Tulsa, secretary; and David R. Weichert, Century Geophysical Company, treasurer.

ASME Section Names Lenhart Chairman

R. P. Lenhart, Service Pipe Line Company, Tulsa, has been named chairman of the Mid-Continent Section, American Society of Mechanical Engineers. Other officers are Carroll M. Leonard, Oklahoma A. & M. College, Stillwater, Okla., vice chairman; Lowell E. Anderson, Service Pipe Line Company, secretary; Carl A. Stevens, Oklahoma Institute of Technology, Stillwater and Tulsa, treasurer; C. O. Raines, Phillips Petroleum Company, Bartlesville, vice chairman for programs; Frank S. Hamlin, Phillips Petroleum Company, Bartlesville, vice chairman for membership; L. W. Ledgerwood, The Carter Oil Company, Tulsa, vice chairman for student membership; and Jim A. Wilson, L. D. McKay Co., Tulsa, publicity chairman.

West Coast Oil Men Honored At Pacific Coast API Meeting

Three West Coast oil men were honored at the Pacific Coast district meeting of the American Petroleum Institute's Division of Production in the Statler Hotel, Los Angeles. Two were presented with API "Citations for Service" while the third was given an API "Certificate of Appreciation."

Recipients of the service citations were T. H. Acres of Sunray Oil Corp., Los Angeles, and B. K. (Kelly) Thorpe, Mills Iron Works, Los Angeles. Acres' citation was for outstanding service to the district as district chairman this year and for serving as general chairman at last year's meeting. Thorpe's award was in recognition of his service as general arrangements chairman for this year's meeting.

H. M. Henderson of Standard Oil Company of California, San Francisco, received the third award for his long service to the Institute's standardization program.

Oilwell Drilling Contractors Appoint Blackburn to Staff

Philip C. Blackburn has been appointed director of engineering and field activities of the American Association of Oilwell Drilling Contractors succeeding Jack Alexander, who left the Association to form a service company in West Texas.

Blackburn came to the Association from the Petroleum Extension Service of The University of Texas where for the past 3½ years he taught drilling mud control and oil field emulsion courses.

Magnolia Scholarships Offered at 15 Colleges

Fifteen universities and colleges in the nation have been designated as institutions at which a Magnolia Petroleum Company scholarships for the school year 1953-1954 will be placed. The grants are achievement awards to aid outstanding students to complete their undergraduate work.

Magnolia scholarships in geophysics will be offered at Rice Institute, Kansas State College, University of Tulsa, Colorado School of Mines, Texas Technological College and Georgia Institute of Technology. Petroleum engineering scholarships have been established at Texas A. & M. College, the University of Oklahoma, the University of Texas, the University of

OIL FINANCING

Our technical and financial knowledge of the oil industry is available to principals of independently or family owned oil and gas properties. If you are contemplating a loan against present production or considering the acquisition or sale of producing holdings, our specialized experience may be helpful.

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PROVEN GEOPHYSICS

The Amazing Attractometer

The latest and most modern method of geophysical exploration that shortens the route to petroleum reserves by rigid instrumental recordings, indicating the existence or not of hydrocarbon accumulations, the approximate depth and quantity underlying the tested area; ten locations for a major oil company without error. Surveys conducted on acreage basis for cash fee and chance to earn small override, oil payment, leases or other interest, where saturation is indicated in commercial quantities. Full information on request.

To establish conclusive proof of the accuracy of our geophysical work, we will test and record on tape bearing your signature one or more wildcat locations in advance of drilling, indicating the existence or not of petroleum in commercial quantities underlying the tested areas and at what depth it may be found.

GEOPHYSICAL SURVEY SYNDICATE

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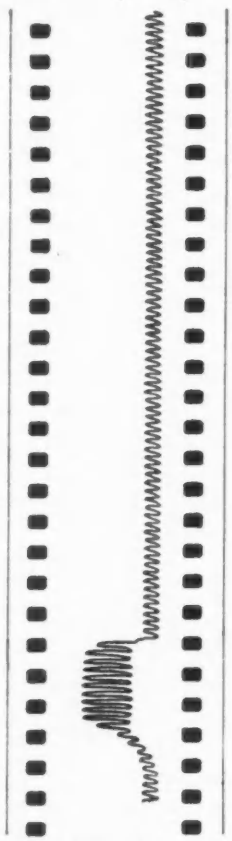

Specimen of tape indicating saturation

ANOTHER *Electric Power* CASE HISTORY

MORE SERVICE LESS SERVICING WITH....

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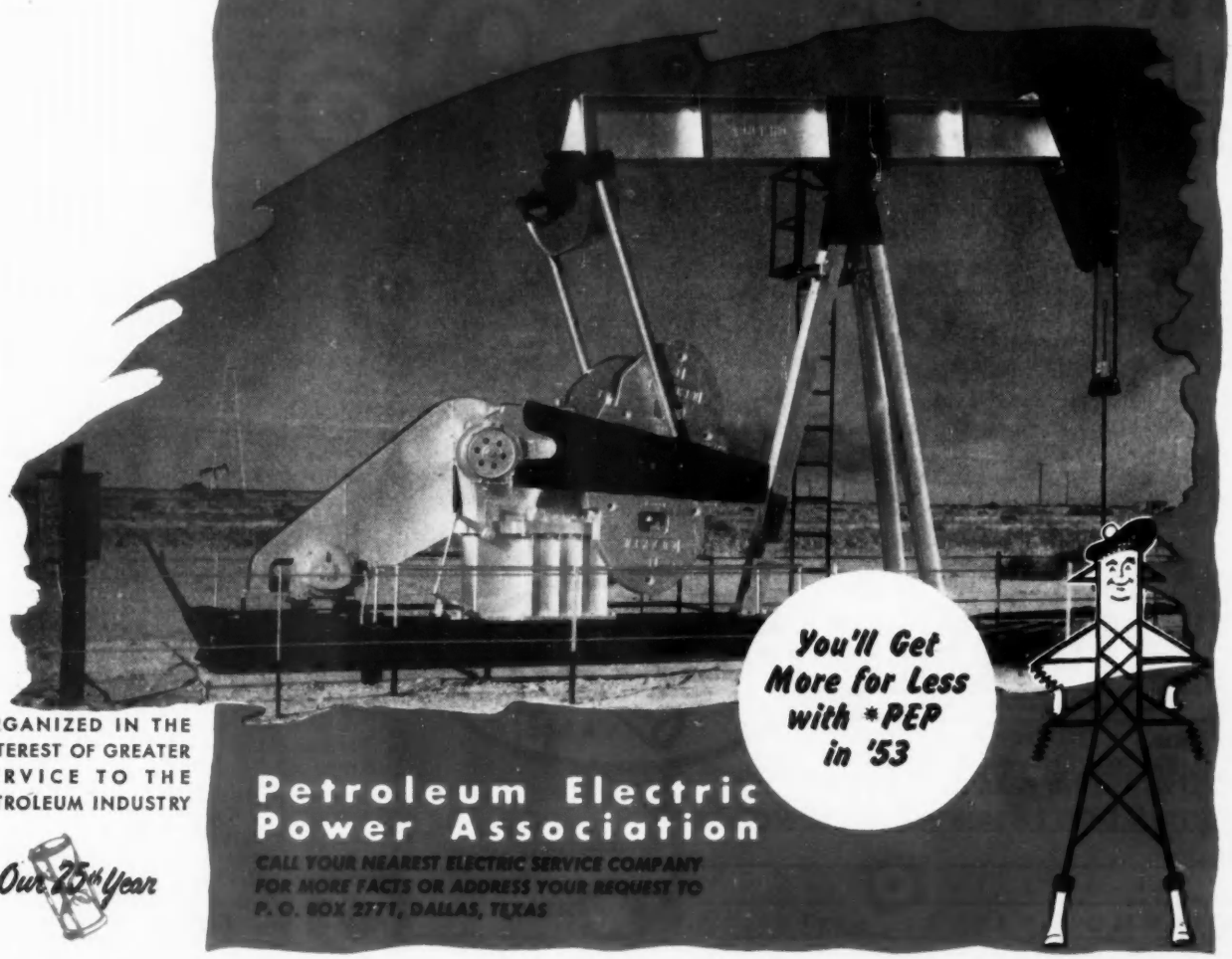
For a service that's dependable, economical and safe and which requires very little maintenance, look to *Low Cost Purchased Electric Power*. Shown below is just one of many wells, operated by a major oil company, utilizing *Low Cost Purchased Electric Power*. Investigate today — maybe you're losing money by not taking advantage of electric power. Contact the Power Engineer of your nearest Electric Power Company for details on how you can go *PEP in '53.

**PEP — Purchased Electric Power*



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ORGANIZED IN THE INTEREST OF GREATER SERVICE TO THE PETROLEUM INDUSTRY

Our 25th Year

Petroleum Electric Power Association

CALL YOUR NEAREST ELECTRIC SERVICE COMPANY FOR MORE FACTS OR ADDRESS YOUR REQUEST TO P. O. BOX 2771, DALLAS, TEXAS

Tulsa, Colorado School of Mines, and Louisiana State University. Geology scholarships have been placed at the University of Michigan, the University of Minnesota, Miami University in Ohio, State University of Iowa and University of Wyoming.

Engineers Conference To Be Held in Houston

The American Society of Mechanical Engineers, Petroleum Division, will conduct its annual petroleum mechanical engineers conference at the Rice Hotel in Houston on September 28-30.

L. S. Wrightsman, Humble Pipe Line Company, Houston, is general chairman of the conference and Dr. E. N. Kemler of the University of Minnesota is chairman of the ASME Petroleum Division.

Geological Well Logging Group Is Organized

The American Association of Geological Well Logging has been organized to advance and foster the science of well logging by geologists. Temporary officers are Dan Kralis, Geological Well Service Company, Abilene, Texas, president; S. F. Peters, Formation Logging Service Company, Los Angeles, vice president; Ted Morgan, Geological Engineering Service Company, Fort Worth, Texas, second vice president; George Warren, Southwestern Oil Well Surveys, Abilene, Texas, treasurer.

Temporary headquarters is at 301 White Building, Abilene, Texas. Interested persons are urged to write Dan Kralis, Box 1992, Abilene.

William H. Strang Succeeds Young As API Director

William H. Strang has been appointed director of the Division of Production of the API to succeed Carl A. Young, who retired July 1 after 29 years of service. Both men are of Dallas, where the API Production headquarters are located. Strang has been assistant director of the Division of Production since 1950 when he first became affiliated with the Institute.

William H. Strang

Strang, 37, studied petroleum engineering at the Colorado School of Mines and the University of Oklahoma, receiving his degree from the University in 1938. He roughnecked in the Kansas oil fields after graduation, then joined Continental Oil Company as an assistant proration engineer. In 1939 he joined the staff of "The Oil Weekly," now WORLD OIL, as research engineer, becoming Gulf Coast editor. Strang became executive editor of the Petroleum Division of the AIME in 1946, establishing the Dallas office of the organization. He also served as editorial director and business manager of the AIME publication, "Journal of Petroleum Technology."

M. L. Trotter Elected President of LPGA

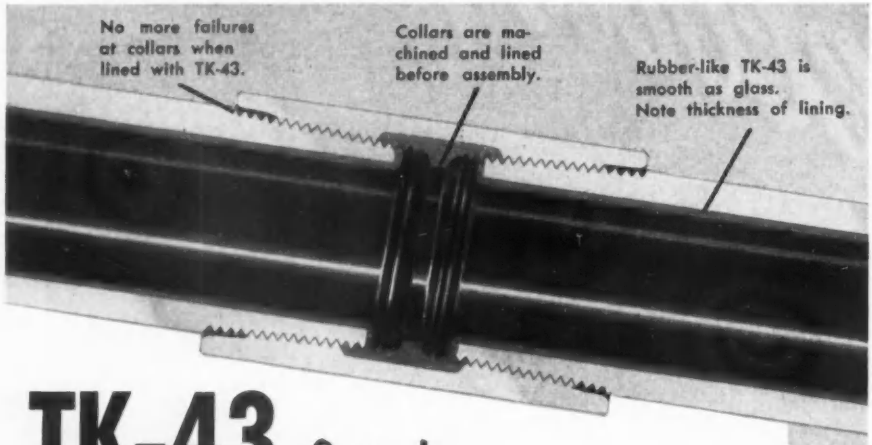
M. L. Trotter, president of the Carolina Butane Gas Company, Columbia, S. C., was elected president of the Liquefied Petroleum Gas Association at its annual convention and trade show in Chicago. Trotter succeeds F. N. Mabee, president of Mountain States Gas Company, Denver, Colo.

Other officers chosen were W. R. Sidenfaden, president, Surburban Gas Service, Upland, Calif., first vice president; Harry Torbit, president, Union Gas & Equipment Corp., Pueblo, Colo., second vice president; Walter H. Miller, president, Dri-Gas Company, Chicago, treasurer; and Arthur C. Kreutzer, Chicago, secretary. Howard D. White, Chicago, is executive vice president.

Los Angeles Desk & Derrick Announces New Officers

Miss Jeannette Funston of Monterey Oil Company was elected president of the Los Angeles Desk and Derrick Club for the coming year. Other officers are Mrs. Dorothy Munger, Munger Oilogram, first vice president; Miss Louise Starkweather, Richfield Oil Corporation, second vice president; Mrs. Dorothy Clancy, Sudduth & Company, recording secretary; Miss Betty Goritz, Western Oil and Gas Association, corresponding secretary; and Miss Minnie Hockett, Bankline Oil Company, treasurer.

Elected as directors for a two-year term were Miss Katherine Barnes, Schlumberger Well Surveying Corporation, and Miss Evelyn Schranz, General Petroleum Corporation. Holdover directors are Mrs. Helen Hurt, British-American Oil Producers, and Miss Anne Ketchum, General Petroleum Corporation.


No more failures at collars when lined with TK-43.
Collars are machined and lined before assembly.
Rubber-like TK-43 is smooth as glass. Note thickness of lining.

TK-43 Guards

ALL Your Pipe - Even the Joints Against Corrosion and Abrasion

Now you can have your salt water disposal piping systems lined for 100% corrosion protection with TK-43, the new rubber-like copolymer plastic lining, applied to the collars and couplings as well as to the pipe. TUBE-KOTE engineers have perfected a method of machining and lining collars and couplings for full protection. Your disposal pipe and flow lines last longer.

Salt or sand, acid or alkali, alcohol or sour crude—TK-43 resists them all. Stop costly replacements and expensive down time—use TK-43, applied to your new or used pipe in the TUBE-KOTE plant. Get details today!

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Please send me full details on your TK-43.

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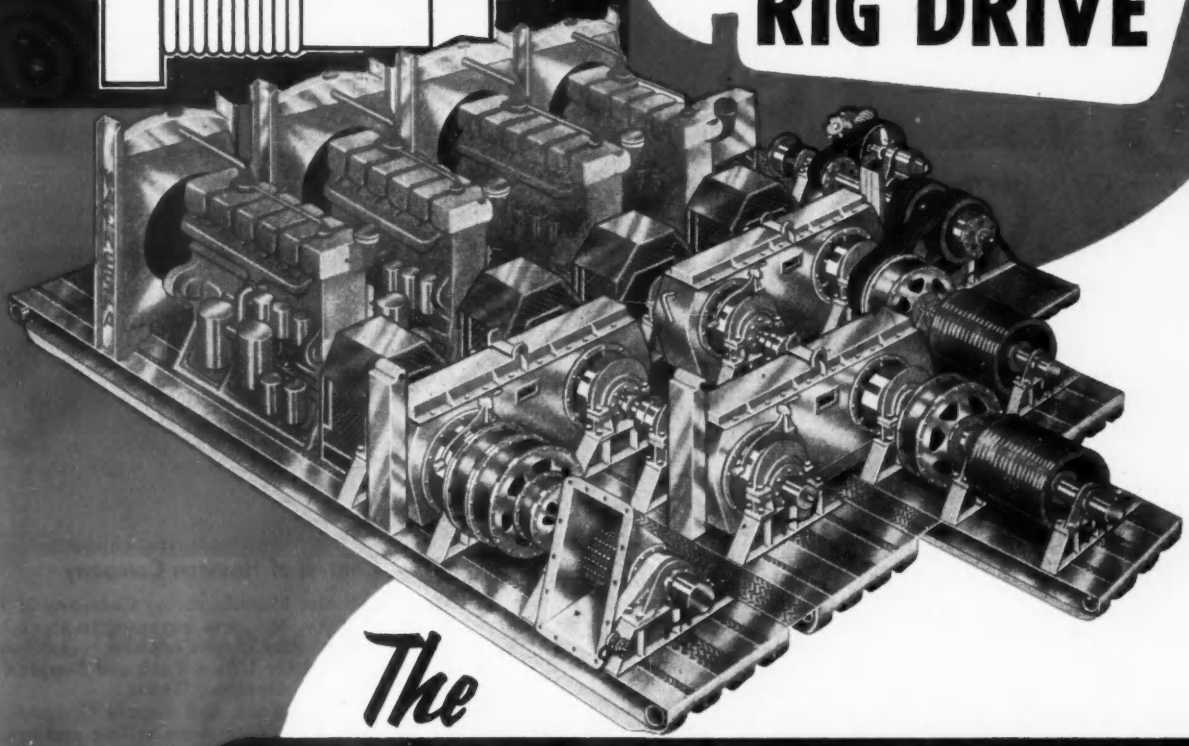
SEND THIS COUPON NOW FOR FULL DETAILS!

AS SHOWN AT OIL SHOW

ANY ENGINE

ANY DRAWWORKS

MID-CONTINENT RIG DRIVE



The MID★CONTINENT Swinging Compound

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The Answer to Drilling Power Problems with Any Combination of Power, Drawworks and Pumps

MID-CONTINENT Supply Company

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What's Happening

AMONG SERVICE AND SUPPLY MEN

GSI Supervisory Conference Held in Dallas

Methods of improving management proficiency and new developments in Geophysical Service Inc.'s methods of geophysical exploration were discussed at the third annual GSI Supervisory Conference held recently at the plant in Dallas. GSI management personnel attending the conference were, left to right, standing, B. A. Harris, supervisor, McAllen, Texas; Roy Fuller, correspondence training director, Dallas; Paul Swenson, supervisor, Bakersfield, Calif.; Earl Thomas, supervisor, Austin, Texas; Ray Wright, supervisor, Houston; R. D. Everett, personnel director, Dallas; M. E. Trostle, party chief, Rankin, Texas; Chris Elston, supervisor, Houma, La.; E. A. Kiesler, supervisor, Calgary, Alberta; J. L. Stephens, supervisor, Peace River, Alberta; J. V. McManus, chief field service engineer, Dallas; Clark E. Allen, supervisor, New Orleans, La.; Gordon Cloepfil, supervisor, Billings, Mont.; J. W. Gary, manager of equipment, Dallas; V. W. Teufel, supervisor, Shreveport, La.; T. A. Halbrook, supervisor, Calgary, Alberta; C. M. Moore, Jr., vice president of Geophysical Service International Corporation, Calgary, Alberta; R. H. Rainey, supervisor, Calgary, Alberta; J. M. Proffitt, supervisor, Houma, La.; and E. A. Vetter, controller, Dallas. Left to right, seated, G. J. Kohler, Jr., division manager, Mexico, D.F.; D. W. Rockwell, supervisor, Mexico, D.F.; K. E. Burg, technical vice president of Geophysical Service Inc., Dallas; Robert Dyk, division manager, Denver; F. J. Agnich, executive vice president of Geophysical Service Inc., Dallas; F. E. Romberg, division manager, Houston; T. P. Ellsworth, division manager, Bakersfield, Calif.; and E. J. Stulken, chief seismologist, Dallas.

John J. McCloy Elected To Westinghouse Board

John J. McCloy, former U. S. high commissioner for Germany and now board chairman of The Chase National Bank, New York, has been named to the board of directors of Westinghouse Electric Corporation.

McCloy succeeds Winthrop W. Aldrich, now U. S. Ambassador to Great Britain, whom he also succeeded as Chase board chairman.

A graduate of Amherst College and Harvard Law School, he was admitted to the New York Bar in 1921. In 1940, he was named a consultant to the then secretary of war, Henry L. Stimson, and the following year became assistant secretary of war.

He became president of the International Bank for Reconstruction and Development (World Bank), and in 1949 was appointed U. S. high commissioner for Germany, a post he held until mid-1952.

McCloy became chairman of the board and a director of Chase in 1953. He is also a director of the American Telephone & Telegraph Company and the Metropolitan Life Insurance Company.

Youngstown Sheet and Tube Elects Directors and Officers

Ten directors of The Youngstown Sheet and Tube Company reelected recently are Leon A. Beeghly, George C. Brainard, John W. Ford, S. Livingston Mather, J. L. Mauthe, John P. McWilliams, Rollin C. Steese, Fred Tod, Jr., Walter E. Watson and Lewis B. Williams.

A. S. Glossbrenner, vice president—operations, was elected to the board of directors to fill the vacancy created by the death of Frank Purnell, chairman of the board.

All officers were reelected. These include Mauthe, president; Watson, first vice president; Glossbrenner, vice president—operations; James E. Bennett, general counsel and secretary; William N. McDonald, comptroller; John H. Hall, treasurer; Robert F. Doolittle, assistant general counsel and assistant secretary; Arthur C. Joachim, assistant secretary and assistant treasurer; and K. Calvin Sommer, assistant treasurer. L. E. Wallace, general manager of sales, was elected an assistant vice president.

Rockwell Manufacturing To Open New Texas Plant

Rockwell Manufacturing Company will open a new valve and meter plant at Sulphur Springs, Texas, during the latter part of the year. The plant will be devoted largely to production of Nordstrom valves, particularly four-inch and smaller steel Hypreseal valves in every pressure range.

The new factory will serve the South and Southwest and a large portion of its output will go to oilfields in Texas, Oklahoma, Louisiana and Mississippi.

Cummings Elected to Board Of National Supply Co.

Naurice G. Cummings of Houston, a vice president of The National Supply Co., has been elected to its board of directors.

Cummings joined the company in 1940 as vice president in charge of its Texas Division. In 1951 the division was divided into the Gulf Coast Division and Southwest Division, both under the supervision of Cummings.

Butler Manufacturing Gains Control of Houston Company

Butler Manufacturing Company of Kansas City, Mo., has increased its stock holdings so that it now has the controlling interest in the Union Tank and Supply Company, of Houston, Texas.

Union Tank and Supply Company has for several years been selling and erecting Butler bolted tanks in the Mid-Continent and Rocky Mountain area fields. In addition, Union manufactures, sells, and erects welded tanks, heaters, treaters, separators, and other items of oil field equipment. The administrative offices of Union, a warehouse, and a manufacturing plant are located in Houston. Sales offices and branch warehouses are located at numerous points throughout the sales territory.

Donald E. Norquist, formerly with Butler, has been elected president of Union Tank and Supply Company. Norquist will direct operations from Houston.

Demco Announces Transfers Of Sales Representatives

W. B. (Bill) Hickman, sales representative for Drilling Equipment Mfg. Co. in Oklahoma and the Texas Panhandle for the past three years, has been transferred to Casper, Wyo., and promoted to district manager in charge of operations in the Rocky Mountains and Canada.

Replacing Hickman as sales representative in Oklahoma and the Texas Panhandle is Jim Allen, who has been promoted to this post from the Oklahoma City office. Prior to joining Demco, Allen was with Emsco Derrick & Equipment Company in Los Angeles for two years.

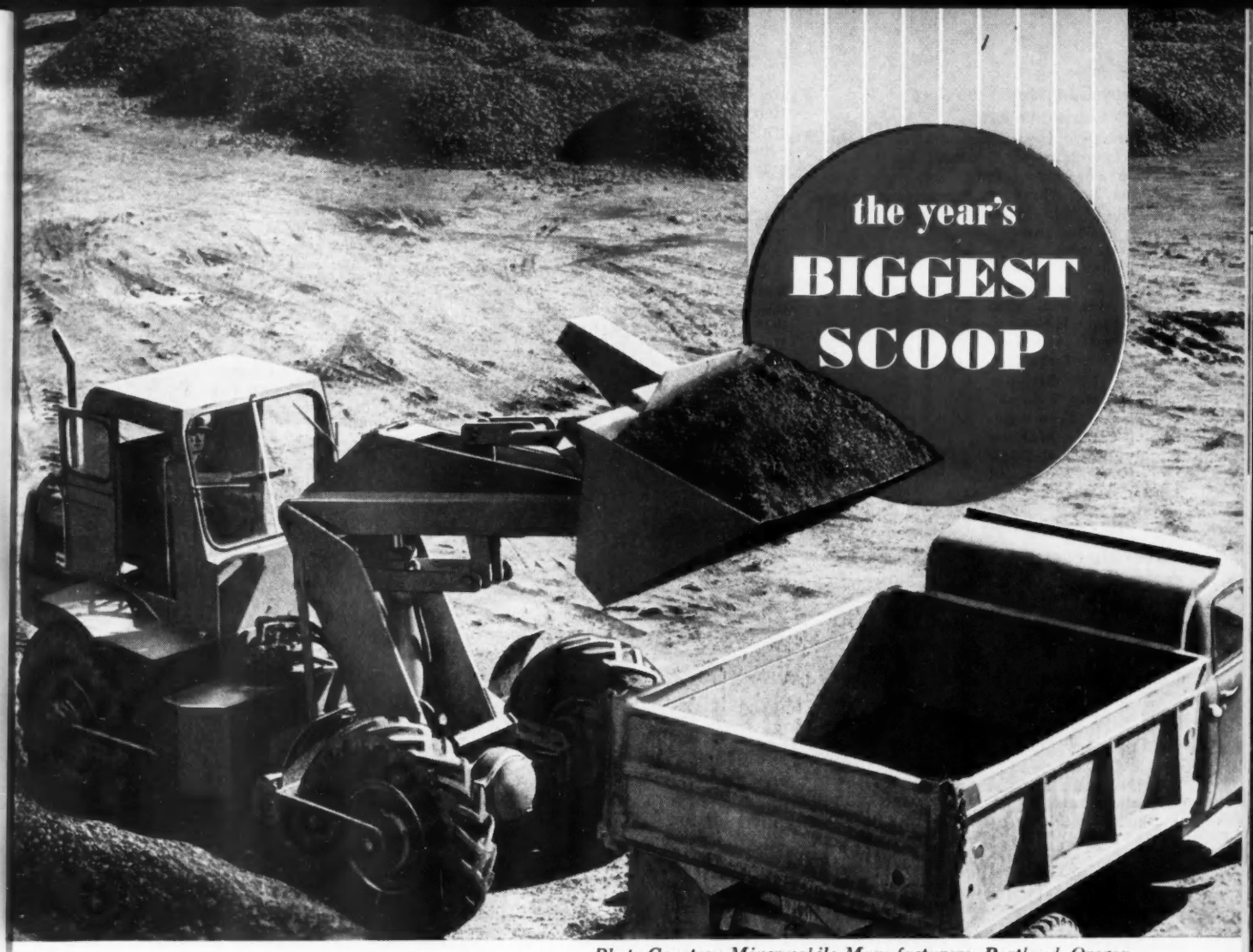

Photo Courtesy Mixermobile Manufacturers, Portland, Oregon

180 horsepowered Scoopmobile loads 4319 yards of wet sand in 31 hours!

No stranger to hard work, this loader. Each time it bends down, a hydraulically operated loading bucket picks up, carries and loads as much as two cubic yards of dirt, rock or sand. Four-wheel planetary gear drive and four-wheel power steering are combined for plenty of power, amazing speed and maneuverability. Five-speed transmission enables top performance under any conditions of terrain.

Like others, this manufacturer powers with Chrysler because he *knows* every Chrysler Engine is engineered for long-lived, top-profit performance. He selected the husky Model 20 Chrysler V-8 Industrial Engine. Result: *more* work in *less* time.

Chrysler can equip its 180 horsepower Model 20, or any of its Industrial Engines, to meet special requirements. For example, Chrysler can supply engines with propane or natural-gas burning carburetor, gyrol Fluid Coupling or torque converter.

Chrysler Industrial Power is not expensive. Production-line methods adapted to specialized engine building provide a custom-built engine at mass-production prices. See a Chrysler Industrial Engine Dealer or write: ***Department 167, Industrial Engine Division, Chrysler Corporation, Trenton, Michigan.***

CHRYSLER
Industrial Engines

HORSEPOWER WITH A PEDIGREE

McEvoy Company Transfers Ites to Louisiana Area

Barney E. Ites, representative for McEvoy Company of Houston, has recently been transferred to Houma, La., where he will make his headquarters, aiding oil company personnel in the problems dealing with high pressure valves and well head equipment. His territory will include Southern Louisiana, east of the Atchafalaya River.

Barney E. Ites

Ites has been associated with McEvoy Company for the past 12 years, working out of the Houston office as a special trouble shooter.

Colorado Fuel and Iron Opens Sales Center in Wichita

A new warehouse and sales center for steel products, chemicals, and fuel has been opened in Wichita, Kansas, by The Colorado Fuel and Iron Corporation.

Serving the expanding agricultural, oil, construction, and manufacturing industries of Oklahoma, Nebraska, Missouri and Kansas, this sales and warehouse center will occupy 30,000 square feet of floor space. It will be sales distribution point for the products of CF&I's eastern and western plants.

Sales offices occupy 2000 square feet of the floor area, and will handle distribution of coal and coke and various chemicals—including benzol, naphthalene, creosote and fertilizer—as well as CF&I's steel and wire products.

Pacific Centrifugal Pumps To Be Made in Canada

Elmer J. Weis, vice-president and sales manager of Pacific Pumps, Inc. (Huntington Park, California) recently announced the signing of an agreement with Hugh Harper, president of The Linde Pump & Engineering Company Ltd. (Montreal, Quebec, Canada) for the manufacture, sales and servicing of Pacific custom-built centrifugal pumps in Canada. The pumps will be marketed under the trade name of "Linde-Pacific."

The company will operate Linde-Pacific sales and service offices at 48 Front Street E., Toronto; 449 Provencher Avenue, Winnipeg; 500 Campbell Avenue, Vancouver, as well as from the home office, 355 St. Peter Street, Montreal, Quebec, Canada.

Crean Joins Borg-Warner As Administrative Assistant

R. B. Crean has been appointed administrative assistant to Robert S. Ingersoll, president of Ingersoll Products Division, Borg-Warner Corp. Crean resigned as vice president, Eddystone Division, Baldwin Lima-Hamilton Corp., to assume this position. Formerly he was comptroller of the National Electrical Manufacturers Association.

Graetz Named Division Manager At New A. O. Smith Corp. Plant

George M. Graetz has been named manager of Welding Products division of the new eastern plant of A. O. Smith, Corp., now under construction at Lancaster, Penn. For the past four years Graetz had served as assistant to J. J. Bohmrick, group executive of A. O. Smith, and recently had been acting as project manager in development of the new plant for manufacture of welding electrodes.

G. M. Graetz

The Lancaster plant is scheduled for completion early this summer. Graetz previously held works manager positions with Trackson Company and Line Material Company in Milwaukee, Wis., and was an industrial engineer with American Steel & Wire Company at Duluth, Minn.

The A. O. Smith Welding Products Division has announced the addition of three new distributors: Pensacola Welding Supply Company, Inc., Pensacola, Fla.; Worland Oxygen Company, Worland, Wyo.; and Guilford Welding Supply Company, Baltimore, Md.

Rickard to Occupy New Post At Borg-Warner Corporation

A newly created post of director of manufacturing services of Borg-Warner Corp. will be occupied by Frank W. Rickard, previously general superintendent of production at the Chrysler Corporation tank engine plant in New Orleans.

Rickard was divisional superintendent, then assistant factory manager, then director of industrial relations for Continental Motors Corp. in Detroit between June 1943 and February 1949. Throughout the remainder of 1949 he was factory manager of the Military Division of Continental Motors in Muskegon, Mich., leaving there to take an executive post with Chrysler.

J. T. (Tommy) Tucker Named General Manager EMSCO Sales

J. T. (Tommy) Tucker general manager, sales, of Emsco Manufacturing Company. He succeeds Paul Courtney who resigned. Tucker joined Emsco's sales and service department in Great Bend, Kan., 13 years ago. He was later assigned to Wichita Falls, Texas, and Oklahoma City, Okla. In 1946 he moved to Houston as sales manager. As general sales manager he will direct Emsco's domestic and foreign sales, except the products of the D&B Division of Emsco, Garland, Texas, which remain under the supervision of Vice President William C. Kinder. Tucker is a native of Tulsa, Okla.

J. T. Tucker

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RIGID VINYL PIPE AND FITTINGS

EXCLUSIVE KRALOY FORMULATION

NON-CORROSIVE

Guaranteed In Flow, Gathering, and Waste Lines

Improve Your Operation Immediately With American-Made Kraloy D-150 Rigid Vinyl Pipe and Molded Fittings (150 psi working pressure). Available in I.P.S. OD sizes through 4".

Many Proved Advantages Over European Plastic Pipe; Highly Successful Since 1932

- HIGHEST TENSILE STRENGTH
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TYPE B TUBING SPIDER

Stock sizes 1″ to 3″; spiders are available on special order for 2″ x 1″ and 2 ½″ x 1 ¼″ parallel strings.

The Guiberson Type "B" tubing spider is a fast-handling, lightweight tool that can be handled by one man if necessary—and the cost of the "B" is lightweight, too. No other spider in its class offers greater economy, either initially or in the long run.

Despite its exceptionally light weight, the Type "B" spider will hold the longest string, and release instantly without sticking when you pick up. All slips fit the same bowl, and the "B" will not distort or damage tubing. Self-equalizing slips with hard, sharp teeth, give full, large-area contact, assuring positive grip, better load distribution and perfect release.

For positive performance, maximum protection, amazing handling ease and surprisingly low cost, you can count on the sure-grip "B" Tubing Spider.

SAFE THAN SORRY GUIBERSON BETTER BE

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ESTABLISHED 1919 • DALLAS, TEXAS, U. S. A.

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STANDARD
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PETROLEUM INDUSTRY
Since 1905

Regan *type* **A**

TRAVELING BLOCKS

... built for hard, rugged use under the most strenuous conditions. Supporting members in which bearings are housed and to which load is transferred are solid, 2" thick steel slabs. They provide part of the weight which gives the blocks a free-running movement in falling with no load. Helps to spool the wire line easily on the draw works drum when going up light. Expert workmanship makes all parts interchangeable. Regan time proven dual bearings with integral pins rotating with the sheave. Sizes from 160 ton to 300 ton capacity.

Write for special bulletin.

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Forge & Engineering Co.

SAN PEDRO, CALIF.
FORT WORTH, TEXAS

Exclusive Mid-Continent and Export Distributor:
MID-CONTINENT SUPPLY CO.
General Offices: Fort Worth, Texas

Quality - Wrought on the Forge of Experience

John R. Howell Robert T. Dudley

Sterling Electric Motors Announces Promotions

Sterling Electric Motors, Inc. has announced the appointment of two regional sales managers and a district manager.

Kenneth J. Plants

John R. Howell and Robert T. Dudley have been named regional sales managers. Howell will serve for the western part of the United States operating from the Los Angeles plant while Dudley will serve eastern areas with offices in Chicago.

Kenneth J. (Jack) Plants has been appointed district manager for the New York office. Formerly Plants was associated with Goodyear Rubber Sundries, Reynolds Metals and the Plastics Division of the Firestone Tire and Rubber Corp.

IDECO Announces Sale Of Pumping Unit Line

Geo. W. (Jack) Walton, vice president of IDECO, one of the Dresser Industries, has announced the sale of the IDECO pumping unit line to the Alten Foundry and Machine Works of Lancaster, Ohio.

Under terms of the sale, Alten will continue the manufacture, sale, and service of IDECO pumping units, and will also manufacture all spare parts for both the Alten-built IDECO units, and the units built by IDECO prior to the sale to Alten. IDECO pumping unit user's are being advised to order their spare parts requirements directly from Alten at Lancaster, Ohio.

Walton further stated that the sale of the pumping unit business to Alten is the final step in IDECO's overall program to confine its operations to the manufacture of equipment for drilling workover and servicing operations.

Thermal Supply Company Named A-C Distributor

The Thermal Supply Company, Houston, has been named a distributor for Allis-Chalmers motors, controls and pumps in sections of Texas and Louisiana.

Area served by the new distributor in Texas is that east of and including Burleson, Washington, Austin, Colorado, Wharton, and Jackson counties; south of and including Brazos, Grimes, Walker, San Jacinto, Polk, Tyler, Jasper, and Newton counties. In Louisiana, the supply firm is serving Beauregard, Allen, Calcasieu, Jefferson Davis and Cameron parishes.

Elmer Peterson is president and owner of the Thermal Supply Company.

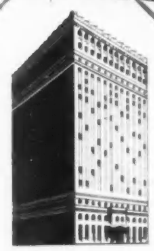
CUT STUCK SAND LINES IN THE WELL

KINLEY SAND LINE CUTTER

M. M. Kinley Company Licensees

ABILENE, TEXAS
Hudson-Eads, Inc. - - - - - - - - - - 2-5331
CORPUS CHRISTI
Tubokut Wireline Services - - - - - - 5-1811
Tuboscope - - - - - - - - - 4-3137, 2-1242
Wireline Specialties Co. - - - - - - 3-2196
HOBBS
Horne Well Service Co. - - - - - - - 3-5396
HOUSTON
Adair Service Co. - - - - WE-6497, PR-4652
Tuboscope - - - - - - - JU-0577, MO-4279
MIDLAND
Luccous - - - - - - - - - - 4-8471, 4-4320
NEW IBERIA
Tuboscope - - - - - - - - - - 1411, 3210-W
OKLAHOMA CITY
Rainbo Service Co. - ME 4-2131, ME 4-4555
WICHITA FALLS
Hudson-Eads, Inc. - 2-3767, 2-8584, 3-4690

BUSINESS and Pleasure in TULSA means-



- AIR-CONDITIONED COMFORT
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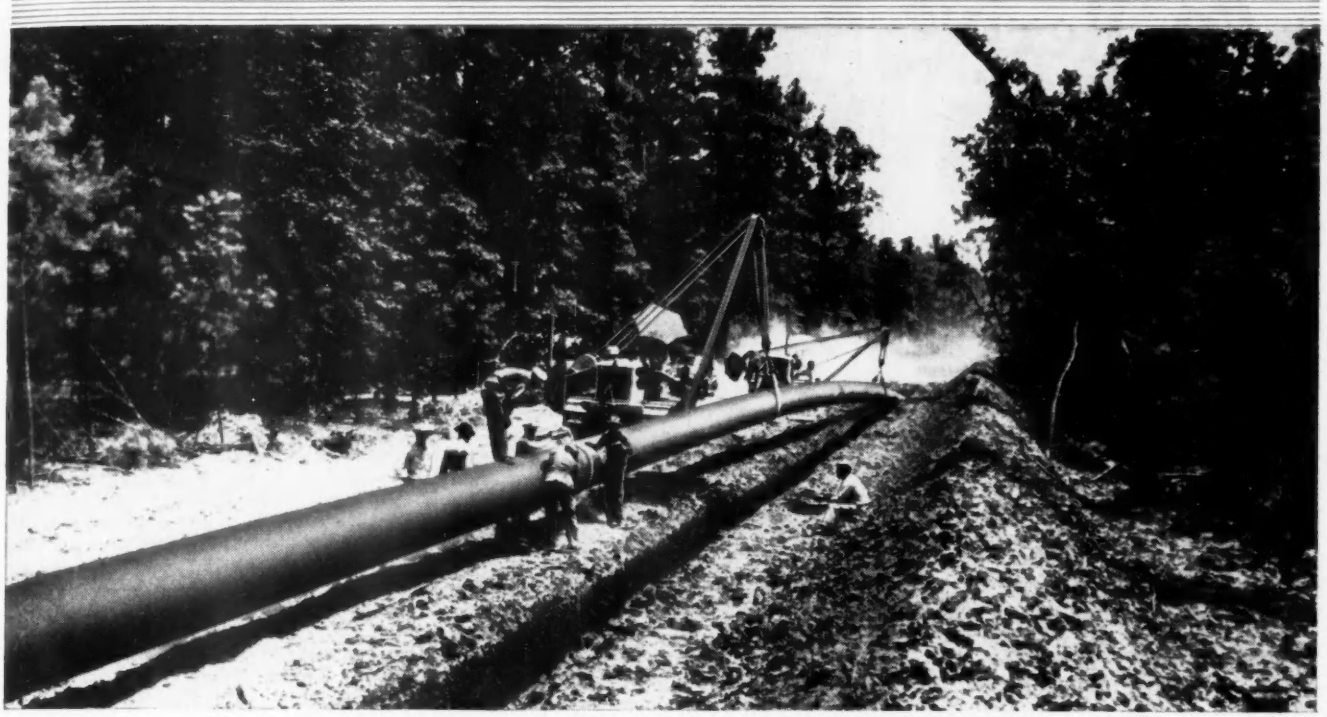
- CONVENIENT COFFEE SHOP
- NEW MODERN ADJOINING GARAGE

THE MAYO
TULSA'S *FINEST* HOTEL
Home of the Popular Terrace Room

PIPE LINE PROGRESS



A. O. Smith Line Pipe being lowered in for a Southern Natural Gas Company Transmission Line.

Southern Natural Gas Company's new lines to tap south Louisiana gas fields

By year's end, Southern Natural Gas Company will have lowered in 311 new miles of 24-inch, 20-inch and 16-inch mains to bring Duck Lake, Main Pass and intermediate production to Gwinville, Mississippi. Here, south Louisiana gas will enter the company's east-west system for distribution to Mississippi, Alabama and Georgia consumers.

This new mileage, except for some field and gathering lines, will all be A. O. Smith line pipe, 68 miles of 24-inch from Gwinville to Franklinton, La., 220 miles of 20-inch comprising the legs to Duck Lake to the southwest and Olga to the southeast. 23 miles of 16-inch extend the Olga leg to Main Pass in the Gulf.

FIRSTS by A. O. Smith: Welded line pipe • Internally expanded pipe • Light-wall large-diameter pipe • World's largest producer of large-diameter welded steel pipe.

Unusual pipelining practices will be employed near the gulf, where much of the land is under water or close to it. Here the pipe will be lowered into canals. Concrete jacketing will be applied as a protective "ballast."

At completion, Southern Natural Gas Company's transmission system will contain more than 1,000 miles of A. O. Smith line pipe, including earlier shipments. Current requirements are being shipped from our Houston and Milwaukee mills in close harmony with the construction schedules.

A. O. Smith Line Pipe is available in a complete range of sizes and wall thicknesses, from 8⅝-in. to 36-in. diameters.

The A.O. Smith Casing Mill is operating at capacity to supply vitally needed casing for the Oil and Gas Industry.

A.O. Smith

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LINE PIPE • CASING

Chicago 4 • Dallas 2 • Denver 2 • Houston 2
Los Angeles 22 • Midland 5, Texas • New Orleans 12
New York 17 • Pittsburgh 19 • San Francisco 4
Seattle 1 • Tulsa 3 • Washington 6, D.C.

International Division: Milwaukee 1

DEPENDABILITY THROUGH RESEARCH AND ENGINEERING

In KANSAS CITY—it's

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week nights. NO Cover . . NO Minimum

YOUR COMFORT is OUR CONCERN

MODERATE RATES
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Situated on Kansas City's Famous
ARMOUR and WARWICK BLVD's.
ROBERT S. NOYES, *Manager*

Be sure the connections ARE LEAK PROOF!

In LP Gas Underground Storage Tubing Strings

Rectorseal has proved to be the only compound that assures leak-proof joints in LP Gas underground storage tubing strings. Rectorseal is your perfect sealant because it's sure, easy-to-use, economical.

It never hardens —never gets brittle. It's thin in the can but thickens in the joint to a plastic elasticity that assures a positive seal for the life of the connection. Make a test—try the best. There's no seal like Rectorseal. Ask for Rectorseal by name at your Supply Store. If they can't supply you, write

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RECTORSEAL
Manufactured by
RECTOR WELL EQUIPMENT CO., INC.
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MAKING THE OIL INDUSTRY SAFER

Edwin H. Fitler Company Opens New Plant

The oldest cordage manufacturing concern in the United States, the Edwin H. Fitler Company, recently staged a formal opening of its new plant in New Orleans, La. The firm is a wholly owned subsidiary of the Columbian Rope Company of Auburn, N. Y. Established in Philadelphia in 1804, the firm was purchased by the Columbian Rope Company in 1948 and plans to move from Philadelphia to New Orleans were announced in 1951. Manila and sisal rope, twine, binder and baler twine and other cordage products will be produced in the new plant. James F. Kirkpatrick, assistant treasurer of the company, is resident manager of the New Orleans plant. Edwin R. Metcalf is president of Edwin H. Fitler Company.

Rockwell Executive Tours European Industrial Plants

Christy A. Wiken, Rockwell Manufacturing Company vice-president—research and engineering, is on a three-month tour of industrial plants in nine nations. The purpose of the trip is to visit the company's licensees in Europe and to investigate the manufacture and use of power tools and meter and valve products by industry abroad. Wiken will visit France, Switzerland, Italy, Austria, Germany, Sweden, Norway, Scotland and England, returning to the U. S. August 4.

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What was up on the kelly when —

- **You changed tours**
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- **You got that drilling break**
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Write now for more information on how RIG RUNNER can help you.

"The Traveling Block Tells the Story"

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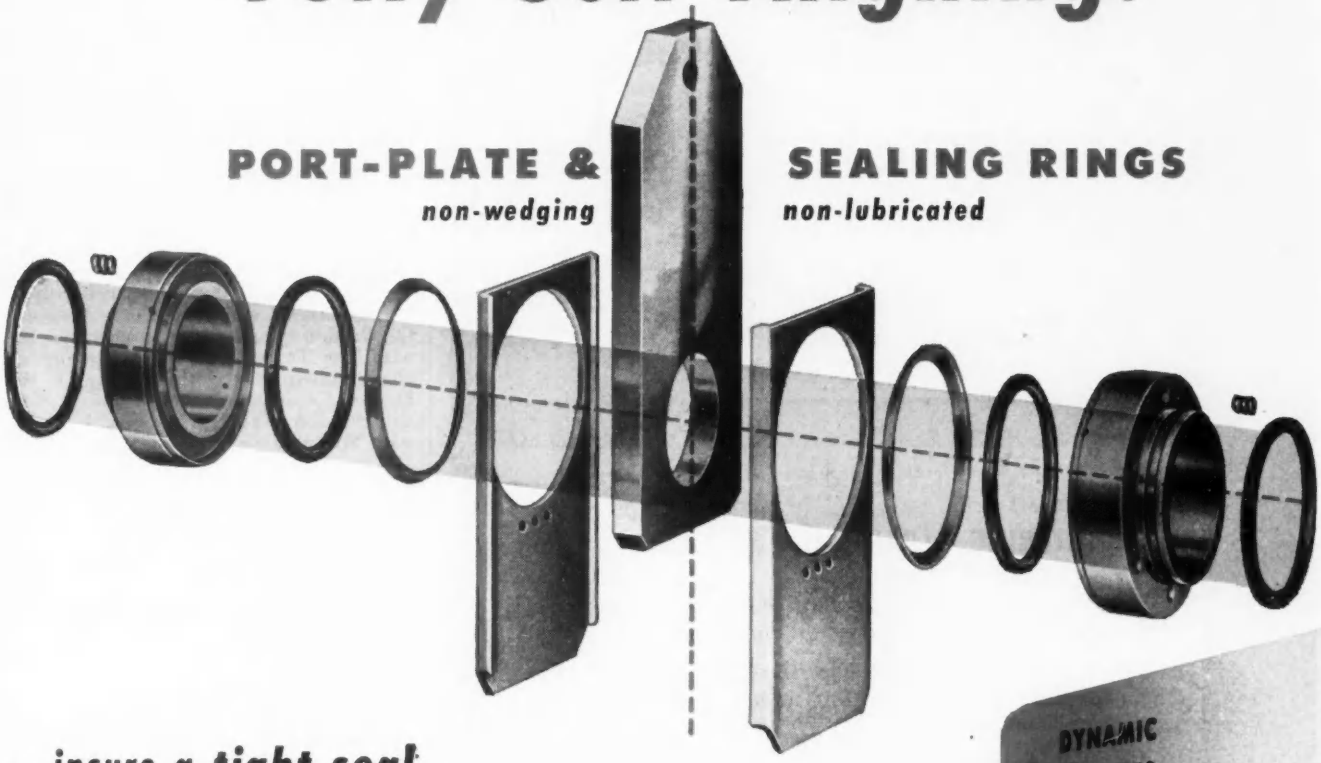
WARREN AUTOMATIC TOOL CO.
1920 HUSSION STREET, HOUSTON, TEXAS
Manufacturers and Distributors of Mud-O-Graf and Pit-O-Graf

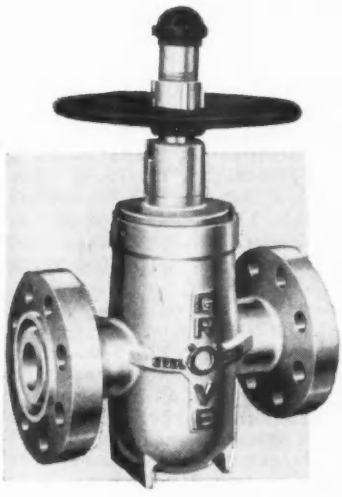
GROVE SEAL-"O"-RING GATE VALVES

Fully Self-Aligning!

PORT-PLATE & *non-wedging* **SEALING RINGS** *non-lubricated*



...insure a tight seal and easy operation



Free floating port-plate and seat rings of Grove Seal "O" Ring Gate Valves insure positive alignment at all times. Smooth sliding operation of port-plate requires much less torque, opening and closing than any other type gate valve. Dead-tight seal is effected by metal-to-metal seating augmented by flexibly resilient "O" Rings. The greater the line pressure the greater the seal. Get full details today.

Write for New Grove Seal "O" Ring engineering bulletin No. G 53.

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- DUAL SEALING
- NON-WEDGING
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Available through leading Oil Field Supply Stores

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all the advantages of

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specialized *engineering* experience
in the Rocky Mountain area
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INDIVIDUAL JOB, or YEARLY CONTRACT BASIS

ENGINEERING DEPARTMENT SERVICES

Static and flowing pressure surveys (for determination of field behavior and proper production rates).

Sub-surface sampling and analysis (for determination of physical properties of oil and gas under reservoir conditions).

Gas well measurements (by Back-Pressure Method, Pitot Tube or Orfice Well Tester)

Supervision of drilling, completion and production (for small operators, out-of-state operators or royalty holders.)

Property evaluation in cooperation with the Chemical and Geological Departments.

also:

Temperature surveys
Gas-oil ratio tests
Surface sampling
(for recombination tests).
Bomb calibrations
Condensate well testing
Equipment specifications

Chem Lab's trailer with Mathey wire line unit which enables subsurface sampling in wells up to 12,000'.

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for fully integrated chemical, engineering, geological and map services.

CHEMICAL & GEOLOGICAL LABORATORIES

LABORATORIES AT CASPER, MIDLAND, GLENDIVE AND EDMONTON

McCullough Tool Announces Promotion of Schaller

Herman E. Schaller, sales engineer of McCullough Tool Company, has been appointed Western Division Sales Manager, Radiation Logging Department. Schaller, who has a M.S. degree in petroleum engineering, has been with McCullough for more than four years.

Herman A. Schaller

Schaller was with the Division of War Research at Columbia University as a field engineer for two years and was consultant to the U. S. Navy on anti-submarine warfare and sonar. Later he served with the Conservation Committee of the California Oil Producers as a field engineer, one year with The Texas Company as development engineer, two years with Eastman Oil Well Survey Company as sales representative and division sales manager and four years with McCullough Tool Company.

J. W. Elizardi, Jr., Joins Fluor As Vice President in Houston

The appointment of J. W. Elizardi, Jr., as vice president in charge of Mid-Continent area sales for The Fluor Corporation, Ltd. of Los Angeles, Engineers, Constructors and Manufacturers, has been announced.

Elizardi, whose headquarters will be in Houston, formerly was Gulf Coast manager for The Marley Company. Previously he served as vice president—petroleum sales for The Griscom-Russell Company in Dallas and Houston. Elizardi is a graduate of Tulane University.

Oilfield Mud Distributors Form Trade Association

Oilfield mud distributors, with dealerships throughout the nation, organized a trade association known as National Oil Field Mud Distributors, Inc. at a meeting recently in Houston. E. R. (Dick) Albert, Jr. of Tulsa, Oklahoma, president of Mud Products, Inc., The Bomud Company, and Beaumont Cement Sales, Company, was elected first president of the new association.

The association was formed to unite all distributors of oilfield mud and chemicals throughout the nation. The association is a non-profit group whose purpose is to promote the interest of all the members to interchange information between them and to represent the members in various dealings with the government regulatory bodies and with oilfield mud manufacturers and other persons with whom the distributors customarily do business.

The new trade association is to be incorporated under the laws of Delaware and its principal office will be at 1650 National Bank of Commerce Building, New Orleans, La.

Other officers elected were Ike W. Hoskins, Mud Supply Company, Lake Charles, La., vice president; Zeke Fowler, Kaffie Lumber & Building Company, Corpus Christi, Texas, secretary; and Nathan B. Gary, Gary-Nees Lumber Company, Bowie, Texas, treasurer.

GSI Marine Division Formed By Geophysical Service

Formation of a GSI Marine Division has been announced by Geophysical Service Inc. Curtis H. Johnson has been named manager of the division with headquarters in offices of Geophysical Service Inc., 6000 Lemmon Avenue, Dallas, Texas.

Curtis H. Johnson

Johnson, who was president of the Society of Exploration Geophysicists in 1952-1953, is a member of the American Association of Petroleum Geologists and the American Geophysical Union. Johnson has moved to Dallas from Los Angeles, where he has been assistant chief geophysicist with General Petroleum Corporation.

The new division was formed to coordinate the company's field parties engaged in offshore seismograph exploration activities.

McEvoy Company Representative Returns from South America

A. C. Oden, sales representative for McEvoy Company has returned from an extensive trip to several South American countries. Oden left Houston in March for Caracas, Venezuela, visiting fields in Eastern Venezuela; to Maracaibo, Venezuela, and to Barranquilla and Bogota, Colombia.

C. L. Garner Is Appointed Sales Manager of Tube-Kote

C. L. Garner has been named sales manager of Tube-Kote, Inc., Houston, applicators and manufacturers of corrosion-resistant linings for tubular equipment.

Trained at the University of Houston and at Louisiana State University, Garner has been with Tube-Kote, Inc., since 1948. He began as a sales engineer covering Louisiana, Mississippi and Arkansas. While stationed at Lafayette, La., he helped organize the Lafayette chapter of the National Association of Corrosion Engineers. He is presently active in the Houston Engineers Club.

Ralph Thornburg Joins Blackmer Pump Company

Ralph Thornburg has been appointed division sales manager of the South Central Division for Blackmer Pump Company of Grand Rapids, Mich. Formerly with Yale and Towne Manufacturing Company where he was sales manager of the Pump Division and recently with Marlow Pumps as eastern district manager, Thornburg is a graduate of the University of Oklahoma. His offices will be maintained in Dallas, Texas.

Ralph Thornburg

chem lab's

full diameter corestudy gives

truer
more representative
more realistic

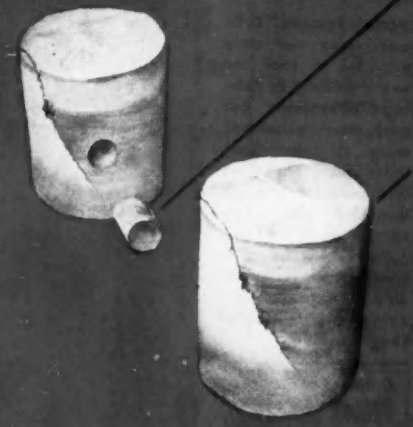
information for
wildcat completion
reservoir information

HERE'S PROOF FROM THE FILES

TYPE OF PRODUCING FORMATION: SANDSTONE

METHOD OF ANALYSIS	CONVENTIONAL PLUG	FULL DIAM. CORESTUDY
Footage analyzed	17	17
Specimens analyzed	17	17
Total porosity—feet	279	226
Total millidarcy—feet	1,542	8,356
Footage of 0.1 millidarcy & higher	14	17
Total volume of specimen analyzed in cu. in.	8	728
Cost of analysis (porosity and permeability)	$68.00	$94.50

Result: **Full Diameter Corestudy analyzed 91 times more volume of specimen at an additional cost of only $26.50.**



WHY TEST THIS PLUG?

it *cannot* measure cracks, fractures, partings, vugs.

WHEN YOU CAN TEST THIS

it *can* measure cracks, fractures, partings, vugs.

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for fully integrated chemical, geological, engineering, map services.

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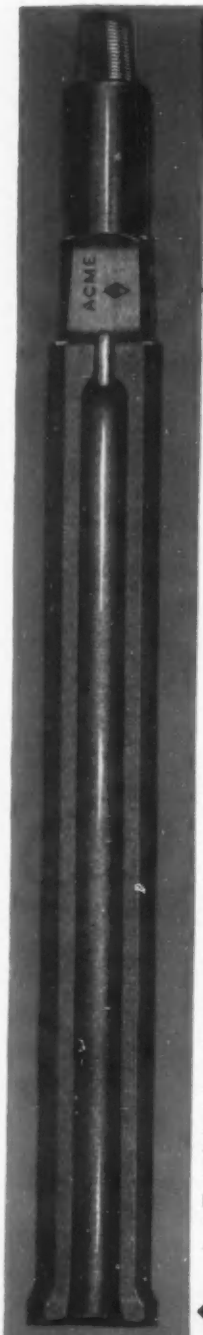

Fig. 108AA Acme Alloy Drillmor Bit

End View

Look for "Diamond A" on the square . . . Marks a genuine Acme Alloy Bit.

Greatest Name in Cable Tools

Acme

TRUSTWORTHY SINCE 1900

offers "Big Chief Alloy"

Greatest (percussion) DRILL BIT Advancement in ½ Century

Acme's New Alloy Bit —that increases hole footage 50% or more over "regular" bits — can now be had at little extra first cost.

This SENSATIONAL Bit was developed to meet great demand for bits fully capable of drilling hardest formations.

Another advantage: this Bit can be dressed and tempered (according to Acme's temperature color chart) in similar manner as recommended for regular carbon steel bits. (Write for chart.)

Deeper penetrating, extreme hardness makes Acme's Alloy Bit hold

Extra Dressing Stock

cutting edge, wear longer and resist battering in toughest drilling. Practically no pin breakage.

It is proving positively the drilling world's finest cable tool Bit . . . Exclusively Acme's.

For ALL about Bit whose EXTRA footage pays-and-pays — write TODAY for Catalog and prices.

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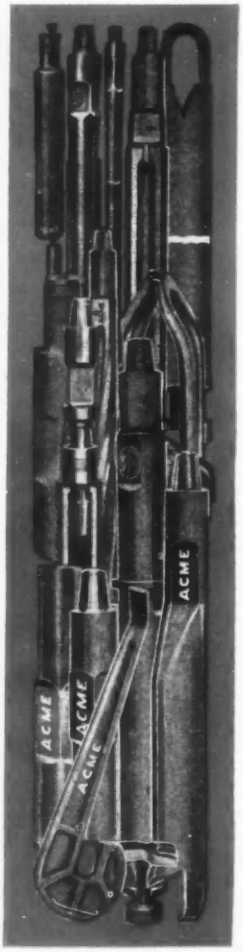
ACME DRILLING & FISHING TOOLS

There's More of EVERYTHING You Need in Acme Tools...

Acme's famous "Drillmor" Line not only provides a tool for every drilling or fishing operation but each tool possesses more of the finer functional features and superior product qualities you need for better in-hole results . . . because specialized toolmanship of over half-a-century accounts for the difference.

Driller's file isn't complete without Acme's Catalog and tool-use Manual and bit dressing (temperature color) chart. Free on request.



PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION MEMBER

Harbison-Fischer Field Men Meet in Fort Worth

A sales meeting was held recently in the home office of Harbison-Fischer Manufacturing Co., Fort Worth, to demonstrate to factory personnel a new "double displacement" sub-surface pump. The new pump, developed with Wilson Manufacturing Co. of Houston, will be marketed as the Harbison-Fischer Wilson "double-displacement" rod pump. Attending the meeting were, left to right, front row: Bill Sutton, Monahans, and Ralph Crenshaw, Houston, Wilson Supply Co.; Don King, Harbison-Fischer representative in Seminole; DeVerne Chamblin, Grayville, Ill.; Bill Webster, Pampa, Texas; Ish Brown, Wichita Falls, Texas; Rex Lawrence, Alice, Texas; Louis Baker, Abilene, Texas; Einar Hofstrom, Ellinwood, Kansas, and J. L. Chance, Kilgore, Texas. Back row: DeRoy Lewis, Fort Worth; Bill Wells, Houston; Art Donnelly, Odessa, Texas; Dick Harbison, Fort Worth; Harry Day, Kilgore; Barney Horrigan, Magnolia, Ark.; Don Nicholson, Hobbs; Lawrence Harbison, Fort Worth; Jimmy Slough, Fort Worth, and Earl Bonnell, El Dorado, Kansas.

Trans-Texas Airways Extends Service With New Routes

Trans-Texas Airways, known as "the largest local service airline operating exclusively within the state of Texas," has increased its service by route extensions through three additional states. The new service, which began in June, extends from Dallas to Memphis through Tyler, Texas; Texarkana, Hot Springs and Little Rock, Ark. The second route extends from Shreveport, La., to Memphis, Tenn., via Camden, El Dorado, Magnolia, Little Rock, Pine Bluff, Stuttgart and Helena, Ark. No changes in the present Texas route pattern now serving 30 cities and four border points have been announced.

Making the trips over the new routes is a fleet of 15 "Super Starliner" DC-3 planes on which the seating arrangement has been changed during the past year to a more modern 26-passenger seating arrangement.

United States Rubber Names Boehm Sales Policy Manager

Chester M. Boehm has been named manager of sales policy, mechanical goods division, United States Rubber Company.

Boehm, former assistant manager of the sales operating department for the same division, has been with the company since 1920. His new activities will cover all hose and belting items except V-belts. His headquarters will remain in the company's general offices at 1230 Avenue of the Americas, New York City.

Magcobar Head Named Vice President of Dresser

H. N. Mallon, president, Dresser Industries, Inc., Dallas, announced that Willard M. Johnson, president of Magnet Cove Barium Corporation, Houston, a Dresser subsidiary, was elected a vice president of the parent company, Dresser Industries, Inc.

Willard M. Johnson

Johnson formerly was executive vice president and director of the Union Bank of Jamestown, Tenn. He organized the Wolf River Corporation, a barite mining company. In 1940, Johnson organized Magnet Cove and has been president of the company since that time. Dresser Industries acquired Magnet Cove in November 1949 and Johnson was elected a director of the parent company in November 1950.

Gallman Is Division Manager Of Security Engineering

William B. Gallman has been appointed West Texas-New Mexico division manager for Security Engineering Division, Dresser Operations, Inc. Gallman will have supervision of all sales and sales personnel work in the West Texas area.

William B. Gallman

Having completed his education in Oklahoma, Gallman moved in 1932 to the East Texas oil fields where he entered oil field rig building and construction work. Gallman formerly was general manager of West Texas Rig Company. Later he was with K. S. Flint Rig Company and Fox Rig and Lumber Company.

Lane-Wells Announces Personnel Appointments

W. A. Johnson has been appointed district superintendent of Lane-Wells North Central Texas district and has been transferred to Wichita Falls. He was formerly district superintendent of Southwest Texas.

W. W. Wilson has been appointed assistant district superintendent of Southwest Texas district, and will be stationed in Alice. G. A. Harris, who has returned from Petro-Tech Service Company in Venezuela, has been named sub district superintendent in Corpus Christi to fill Wilson's former post.

Ross Named Sales Engineer Of Lee C. Moore Corporation

J. H. Ross of the Engineering department of Lee C. Moore Corporation, Tulsa, has been promoted to sales engineer out of the company's Dallas office. Ross was born in Bartlesville, Okla., and after working with the U. S. Bureau of Mines, joined the Phillips Petroleum Company until he enlisted in the Air Force in 1944.

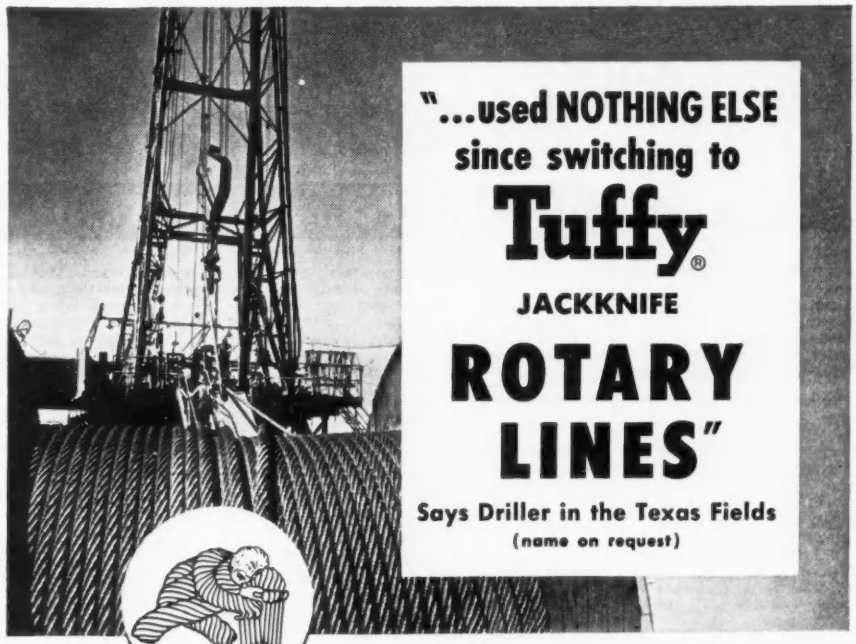
Ross attended Purdue University for three years after being discharged from the Air Force, and joined Lee C. Moore in December, 1951.

Black, Sivalls & Bryson Names Casey District Sales Manager

Tom Casey has been named Tulsa District sales manager for the Controls and Safety Head Division of Black, Sivalls & Bryson, Inc.

Tom Casey

Casey has been with BS&B for the past seven years as a salesman in the Tulsa office. In his new capacity, he will have supervision of sales and service activities of the Controls and Safety Head Division in the Tulsa sales district. Casey will headquarter at the BS&B Tulsa plant.



Here's a typical field report on a driller who recently switched to Tuffy: ". . . gave us another good order. It took about three months to sell him on TUFFY but since then he has used nothing else!"

FREE Ton-Mile INDICATOR

Simplifies Cut-Off Problems

You can quickly figure ton mileage . . . know exactly when to cut off on each hole with this handy Union Wire Ton-Mile Indicator. Send for yours today and avoid wasteful cutting and costly overloading.

New FREE "HANDBOOK of Wire Rope for Well Drilling"

Complete! Factual! Up-to-date! More than 40 pages of useful information. Mail coupon now!

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Wins Steady Customers for Tuffy

If you keep accurate ton mile service records, you may be amazed at the savings Tuffy Rotary Lines can give you. You'll find that Tuffy's special design and construction give higher resistance to abrasion, shock loads, drum crushing and internal friction. That's why they last longer, give better rope performance that wins steady customers. And they're easier to order—just give length, size and Tuffy *Jackknife* or *Standard*.

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☐ Please have a Union Fieldman deliver my FREE Ton-Mile Indicator and Union Log Book and explain its use.

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RATES: Regular Classified (undisplayed) set in this size type: 12 cents per word. Minimum charge, $3. Blind box address in our care counts six words. Replies forwarded without charge. **Situation wanted** ads, 6 cents per word. **Display ads**, set in suitably larger type with ruled border, $12 per column inch; situation wanted display ads, $6 per column inch. Ten percent discount for two or more insertions of same copy in consecutive issues. **All classified ads payable in advance. COPY DEADLINE:** 5th of month preceding date of issue. Send copy and checks to: **Trading Post Section, World Oil, P. O. Box 2608, Houston, Texas.**

HELP WANTED

■ SALES ENGINEER—Familiar with design and sale of gas process equipment—gasoline plants. Box 83-W, c/o World Oil, Houston, Texas.

■ DESIGN ENGINEER: Mechanical Design Engineer with 5 to 8 years experience in design of drilling equipment—specifically draw works, rotary tables, and masts. Progressive expanding company, excellent working conditions and benefits. Salary commensurate with experience. Reynolds Metals Company, 2000 S. Ninth Street, Louisville, Kentucky.

Geophysical Personnel

Party Chiefs, Computers, Operators, Shooters, Surveyors, wanted by major oil company starting its own geophysical organization.

Write giving personal, educational and experience qualifications, and references. All replies confidential.

Box 88-W, c/o World Oil, Houston, Texas.

SITUATIONS WANTED

Drilling contractor operating in West Texas and New Mexico desires to contact small or medium-sized independent oil company who needs an operating manager. Personal interview desired. Twenty years experience in all phases of the oil industry. Address replies to Box 94-W, WORLD OIL, Houston 1, Texas.

■ Office Manager, Controller, Executive Assistant desires responsible supervisory position with growing oil company. Rocky Mountain Area preferred. Presently employed by oil refinery on West Coast. Six years extensive experience with emphasis on public and personnel relations with this company. Accounting background. Age 31. Married. Box 82-W, c/o World Oil, Houston, Texas.

■ MICROWAVE ENGINEER, graduate with FCC operator's license and five years experience in V.H.F.—microwave communication field desires position with pipe line company. Experience includes site surveys, FCC licensing, system design and field installations, one for a large pipe line. Box 84-W, c/o World Oil, Houston, Texas.

■ Land man, 13 years experience, age 33. Now working in Williston Basin. Desires to locate with company in Gulf Coast area. Experience in Texas, Louisiana, Mississippi, Oklahoma, Arkansas and Rocky Mountain region. Reason for change—God's country. Box 85-W, c/o World Oil, Houston, Texas.

■ Geological Draftsman, age 49, married. Now working for a major oil company in foreign country, arriving Aug.-Sept. in the U.S.A. Wishes to work in the U.S.A. or Canada. Letters to C. A. Smith, 2034 Gates Ave., Ridgewood 27, Long Island, New York.

SITUATIONS WANTED

GEOLOGIST with ten years experience with major company. Three years experience in stratigraphy and subsurface in Alberta, Saskatchewan, and Manitoba, Canada; also seven years experience micropaleontology, subsurface, and stratigraphy of Texas and Gulf Coast. Degree from U. of Texas. Available for consulting or permanent position. Miss Drane F. Grant, La Pryor, Texas.

FOR SALE

■ TWO 150 horsepower F and T boilers located at Eunice, New Mexico. Makin Drilling Co., Box 131, Hobbs, New Mexico.

■ National 50 drilling rig, complete less drill pipe, 127 ft. Lee C. Moore jack knife derrick, 8 foot substructure, three NKU Waukeshas, C-250 mud pump, 16-6" drill collars, B. J. Hook, National swivel and traveling block, Bethlehem rotary table. Inventory on request. W. E. Dunigan, c/o Dunigan Tool & Supply Co., Odessa, Texas.

■ 24-L Bucyrus, 1½ ton GMC truck, 1 ton GMC pick up, small and large tools. Inventory on request. W. E. Dunigan, c/o Dunigan Tool & Supply Co., Odessa, Texas.

■ Four 8" C.P. Drill Collars. W. E. Dunigan, c/o Dunigan Tool & Supply Co., Odessa, Texas.

FOR RENT

■ For Rent. At Lafayette, La. Modern office building with private parking area located on Oak Avenue at Coolidge St. (midway between new Oil Center and Business District) consisting of 1700 sq. ft., seven private offices, one large office and waiting room, masonry construction, air conditioned summer and winter, fluorescent and natural lighted. Additional property and large warehouse building located to rear of this property also available if needed. Apply DeClouets, 1301 Oak Ave., phones 8-3163 and 8-3768.

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Immediate delivery of producing and pipe line forms made from our complete line . . . Write for completely illustrated catalog.

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PUBLICATIONS

■ OUT-OF-PRINT geological publications, U. S. Government series and files of technical journals our specialty. Inquiries welcomed. CANNER'S INC., (Dept. W) Boston 19, Massachusetts.

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WILLISTON BASIN ROYALTIES

Dealers in Montana royalties since 1921, we now specialize in royalties under major company leases in the Montana portion of the Williston Basin. For information on our method of operation, write LANDOWNERS ROYALTIES COMPANY, Box 1225, Great Falls, Montana.

LEASES & ROYALTIES

■ Lease Deals: Shallow structures, Kentucky and Tennessee. High gravity oil. Four hundred to nine hundred feet depth. Box 87-W, World Oil, Houston, Texas.

DECALS

TRUCK LETTERING AND TRADEMARK decals made for your trucks. Easy to apply, uniform, distinctive, economical for small or large needs. Write for Catalog. Mathews Company, 827 S. Harvey, Oak Park, Ill.

Gardner-Denver Announces Personnel Appointments

A. G. Lindquist has been elected director of Gardner-Denver Company and A. H. Jones elected vice president.

Promotions of personnel in the Sales department of the company include C. M. George, sales administrator; O. C. Knapheide, Jr., sales manager of the Oilfield & Industrial Division; C. H. Rieman, sales manager of Mining & Contracting Division; J. R. Affre, sales supervisor of Oilfield & Industrial Division: E. A. Linneman, sales supervisor of Contracting Division; and J. A. Caverly, sales supervisor of Mining Division.

Rollway Bearing Elects Williams Vice President

John D. Williams has been elected vice-president and general manager of Rollway Bearing Company, Inc., succeeding William B. Smithers, who resigned. Williams also holds the same positions in Lipe-Rollway Corporation, which owns 100 percent stock interest in Rollway.

Alan T. Lockard Joins R. S. Stokvis & Sons

R. S. Stokvis & Sons, Inc. of New York announce the addition of Alan T. Lockard to the sales organization. Lockard recently has completed two years of service with the Materials Division of the Petroleum Administration for Defense in Washington. Prior to joining PAD, Lockard was with A. V. Simonson and Company, New York.

Clark Bros. District Office Opened in Kansas City

The opening of a new Kansas City, Mo., district office has been announced by Clark Bros. Company, Olean, New York, manufacturers of engines, compressors and turbines. This office has been established to better serve the oil, gas and general industries of the Mid-Central states. Located at 6 East Eleventh Street, Kansas City 6, the office will be under the direction of A. G. Van Campen, former district manager of the Clark Tulsa office.

To fill the position vacated by Van Campen Clark has appointed William H. Barnes district manager.

Maloney-Crawford Announces Transfer of O. W. Maloney, Jr.

O. W. Maloney, Jr., sales engineer with Maloney-Crawford Tank and Manufacturing Company, has been transferred from Ardmore, Okla., to Tulsa.

Maloney has been with Maloney-Crawford since 1946 and has served in various Maloney-Crawford offices and districts, including New Orleans, West Texas, Dallas, Oklahoma City and Ardmore.

Maloney is the son of O. W. Maloney, Sr., vice president of the company.

New Books, Maps and Movies

IRA RINEHART'S 1953 YEARBOOK, 2 volumes, Rinehart Oil News Company, Box 1208, Dallas, Texas, $25 to subscribers and $35 to non-subscribers.

Volume 1 is a statistical and graphical summary of 1952 well information, supplemented with geologic forecasts for 1953. The book includes the exclusive area-by-area opinions of 12 leading geologists who analyze 1952 activity and results for indications of 1953 prospects. This forecast section takes the form of an illustrated 61 page symposium introducing Volume I of the Yearbook. Among other special features is an article, "The Domestic Producer in 1953," by Charlton H. Lyons, president of the Independent Petroleum Association of America, devoted to such industry problems as steel, crude prices and imports. The exploratory section includes detailed reports on 1987 discoveries, new pay openers and major extensions in 20 states of the Rocky Mountains, Oklahoma-Kansas, Texas, Arkansas-Louisiana and Southeastern States regions.

GRAPHIC PROBLEMS IN PETROLEUM GEOLOGY, Dr. L. W. DeRoy, Professor of Geology, Colorado School of Mines, and J. W. Low, Regional Stratigrapher of The California Company, Harper and Brothers, $1.

A text for familiarizing students in petroleum geology with the latest methods of analyzing structural and stratigraphic problems, this report includes 35 problems, most of which have been class tested by students of the Colorado School of Mines.

OIL PIPE LINE CONSTRUCTION AND MAINTENANCE, Petroleum Extension Service, The University of Texas Division of Extension, first edition, February, 1953. $3 postpaid in the U. S., $3.25 postpaid elsewhere.

This manual is Volume II of the four-volume-series being published on oil pipe line transportation under the auspices of the Division of Transportation of the API. Chapters on capacity design and specifications, construction, materials, maintenance, corrosion control and fire and accident prevention are included. Some subjects, although technical, have been simplified and made as understandable as is practical to do for the average employe.

THE SCIENCE OF PETROLEUM, THE WORLD'S OILFIELDS, Volume VI, Part I, Professor V. C. Illing, editor, Oxford University Press, 114 Fifth Avenue, New York 11, N. Y., 1953. $20.

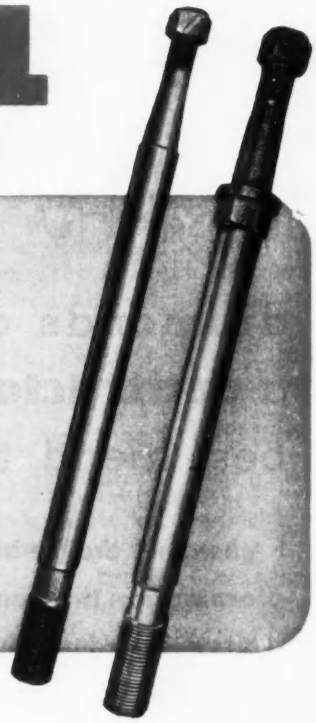
This volume represents the first section to be prepared in the revision of Volume I to bring the publication up to date and give fuller treatment to the material covered in the first volume 14 years ago. Thirty geologists present information on oil fields of the Eastern Hemisphere. Divided into four sections, the book contains bibliographies and numerous maps and figures regarding the occurrence of petroleum in Europe, the Middle East, the Far East and Australasia, and Africa. The major gap is the absence of articles on the U. S. S. R., an area about which articles necessarily were omitted rather than present an incomplete picture.

OIL PRICES AND COMPETITION, Harold Fleming, American Petroleum Institute, 1953.

This book, issued by the API Oil Industry Information Committee, was written in an effort to seek better public understanding of oil prices. Fleming was assigned to find out first hand from oil men in all segments of the industry how petroleum prices are determined in actual practice. This book contains his findings and conclusions. Among the aspects presented are the economics of the retail gasoline business, the wholesale gasoline market, economics of refining and crude oil prices.

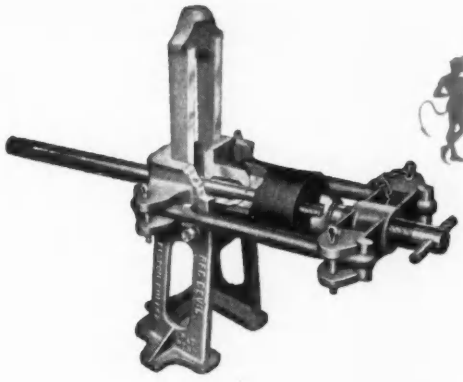
RED DEVIL

"DIA-HARD" PISTON RODS



For high pressure abrasive service

RED DEVIL Piston Rods are first choice where drilling conditions are severest because of the extreme hardness of the deep HIGH-CARBON wear resistant "DIA-HARD" case, coupled with tough core properties which give the highest tensile strength against breakage. All rods are hardness tested and precision gauged to maintain a world-wide reputation for quality. Write for Catalog No. P-101.



RED DEVIL **PISTON PULLER**

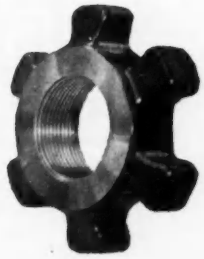
For tapered type rods

The usual practice of removing pistons from rods by blows of a sledge hammer often damages either pistons or rods. A Red Devil piston puller easily and quickly removes badly stuck pistons without injury to either part. All elements are made of finest quality alloy steel, heat-treated for strength and long life. Write for Catalog No. P-106.

RED DEVIL **PISTON ROD LOCK NUT**

These "Hammer Lug Type" nuts provide a fast and positive means for locking piston rod in crosshead. Made from alloy steel and heat treated, they will last indefinitely. Face of nut is precision machined for full seating surface at right angles to axis of threads to prevent fatigue stresses in rod. Write for Catalog P-102.

Complete information in Composite Catalog or write for price catalogs noted above. Red Devil products are available through your supply store.



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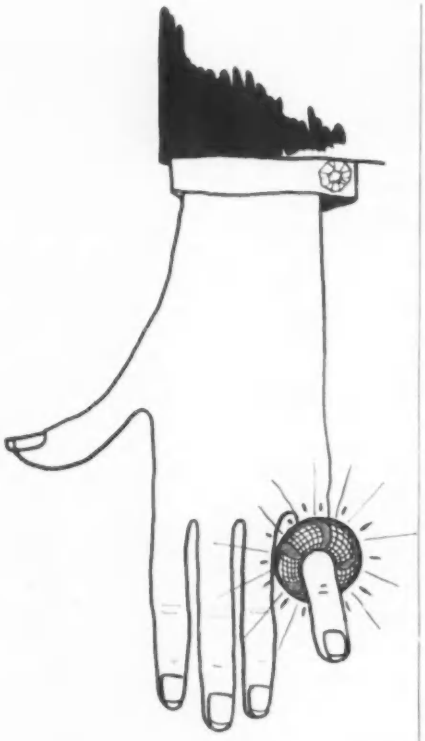

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DIAMOND BIT CO.

SQUEAKS from the BULLWHEEL

Sunday School Lesson

"What was your Sunday school lesson about?" asked the mother as her small daughter returned from church.

"About a man named Solomon," the child answered.

"And what did you learn about Solomon?"

"Teacher said he had 300 wives and 7000 cucumber vines!"

•

Conversation in Marriage

You've got to admit that if the majority of married people didn't say mean things they wouldn't say anything, and that silence is torture.

•

Different Law

Country Constable: "Pardon, miss, but swimming is not allowed in this lake."

City Flapper: "Why didn't you tell me before I undressed?"

Constable: "Well, there ain't no law against undressin'."

•

College Days

While Homer was home from college his mother insisted on unpacking his trunk. While engaged in this pastime, she took out a coat with a pawnshop tag on it?"

"Homer, what's this tag for?"

"Oh, I went to a dance and checked my coat," replied Homer.

Presently his mother hauled out a pair of trousers with the same tag on it.

"Homer, just what kind of a dance was that?"

•

No Problem

A woman went to buy a drinking bowl for her dog, and the shopkeeper asked if she would like one with the inscription,

". . . . and this is one of those salt domes the geologists talk about!"

"For the dog."

"It really doesn't matter," she replied. "My husband never drinks water, and the dog can't read."

•

Great Career

Young actor: "I've got a job at last, Dad. It's a new play and I play the part of a man who has been married for 20 years."

Father: "Splendid. That's a start anyway, my boy. Maybe one of these days they'll give you a speaking part."

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water cans and coolers
GOTKOOL WATER CAN
Made in 1½, 2, 3, 5, 10, 15 and 20 gallon sizes. Push-Button Faucet at slight additional cost.
KEEP PURE DRINKING WATER ALWAYS HANDY
GOTKOOL WATER COOLER
Made in 2, 3, 5, 8, 10, 15 and 20 gallon sizes with Push-Button Faucet.
GOTT Water Coolers are the convenient way to keep drinking water handy to the worker, protect it from impurities. Their exclusive construction keeps water cool for long periods. Snug-fitting, large, removable top, handy non-leaking push-button faucet. GOTT Water Cans for handy field use. Your supply store has them, get one today!
STANDARD OF THE OIL FIELDS
Insist on the Genuine
GOTT
WATER COOLER
H. P. GOTT MFG. CO.
WINFIELD, KANSAS

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In Perforating, Logging, and Fishing Tool Services

McCULLOUGH
NEW SERVICES • NEW TOOLS
NEW WAYS OF DOING THINGS

Latest News About New Tools, Techniques and Services

NEW

McCULLOUGH *Radiation Well Logger with* SCINTILLOMETER (GAMMA RAY AND NEUTRON LOGS)

Accurate, Reliable, Consistent and Stable Logs on Every Run in the Well

Present day well completion programs are often based solely on logging information. Therefore, that information must be accurate and consistently reliable. The security of your entire drilling investment depends on the dependability of the information given by the log.

That's why operators everywhere are specifying the amazing new McCullough Radiation Well Logger with Scintillometer. It is the most accurate and reliable logging instrument available to the oil industry. It is a stable instrument, and because of its stability, it is consistently reliable—one or ten trips in the same well, you'll always get the same answer.

Here are some of the reasons why the McCullough Radiation Well Logger with Scintillometer gets such accurate, dependable results:

1. The Scintillometer is very short compared to the length of gaseous type counters. This enables the measurement of formations with a great deal more detail. It will measure and define very thin beds that would be averaged out with the longer counters.

2. The efficiency of the Scintillometer in measuring radiations approaches 100%. Gaseous type counters may have an efficiency in the order of 2% or less.

3. As a result of the short length and high efficiency of the Scintillometer, a much more detailed log can be produced at a faster logging speed than with other methods.

4. The Scintillometer responds only to external excitation and thus can be calibrated on an absolute scale. This scale is in International Units and assures a more accurate quantitative interpretation.

5. Because of the extreme stability of our equipment, we are able to duplicate successive runs in the same well with accuracy.

6. Characteristics such as time constant and sensitivity are controlled at the surface. Thus, these variables can be set to provide the operator with as much or as little detail in his log as he desires.

7. The Scintillometer will record the entire range of gamma radiations, or only a certain band within the range can be recorded if desired.

8. It has no instrument, temperature nor discernable cosmic drift and can be used as a valuable reference tool.

9. Simultaneous recording of a collar log simplifies "pin-point" perforating later.

10. The original record is reproduced as the final log—no retouching nor tracing is necessary.

THE McCULLOUGH RADIATION WELL LOGGER WITH SCINTILLOMETER (GAMMA RAY AND NEUTRON) IS AVAILABLE IN MOST ACTIVE OIL FIELDS—CALL YOUR McCULLOUGH SERVICE ENGINEER FOR COMPLETE INFORMATION.

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Something for All

The merchant was on his death bed and called in a lawyer to have his last will and testament prepared.

"Fix it so that my overdraft at the bank goes to my wife—she can explain that," the merchant ordered. "My equity in my car goes to my son, he will then have to go to work to keep up the payments.

"Give my good will to the supply houses, they took some awful chances on me and are entitled to something. My equipment give to the junkman, he has had his eye on it for several years.

"And I would like six of my creditors to be pallbearers—they have carried me so long they might as well finish the job."

•

Please Lady!

One evening a young matron was returning from a First Aid class, and she came upon a man sprawled face down on a darkened side street.

"Ah!" thought the girl, "Providence has led me hither to minister to this poor unfortunate." Parking her car nearby, she rushed over and began artificial respiration. Presently the man stirred, looked up, and speaking with difficulty, said: "I'm holding a lantern for a guy working down in this manhole. I ain't sure what you're up to, lady, but this ain't the time or the place."

•

Substitute

Captain (on ferry, shouting down into crew's quarters): "Is there a mackintosh down there big enough to keep two young ladies warm?"

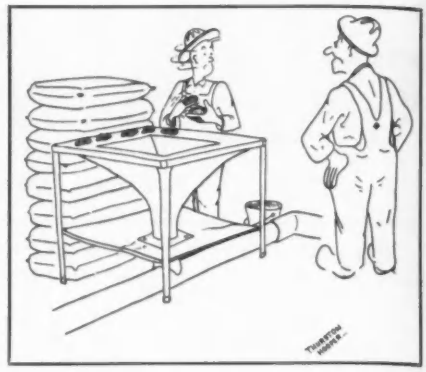
Voice from below: "No, but there's a McMichael who's willing to try."

•

Sunday School Lesson

A Sunday School teacher was showing her class a picture of the Christian martyrs in a den of lions. One little boy seemed very sad about it.

"Gee," he exclaimed, "look at that poor lion away in the back. He won't get any."



Boss Is Right

"They tell me that you pushed a wheelbarrow down the street last night right after our company party. Is that right?" asked the Boss.

"Yes, sir. I was pretty well cocked," admitted the Wage Slave.

"Well, how do you think I feel over the possible loss of prestige that your actions may have brought upon our business?" asked the Boss.

"I never thought to ask you, Boss. You rode in the wheelbarrow."

•

Genius or Idiot?

One of the greatest marksmen of the FBI was passing through a small town, and everywhere he saw evidences of the most amazing shooting. On trees, on walls and on fences there were numberless bull's-eyes with the bullet hole in the absolute center. He asked to meet the person responsible for this great marksmanship. The man turned out to be the village idot.

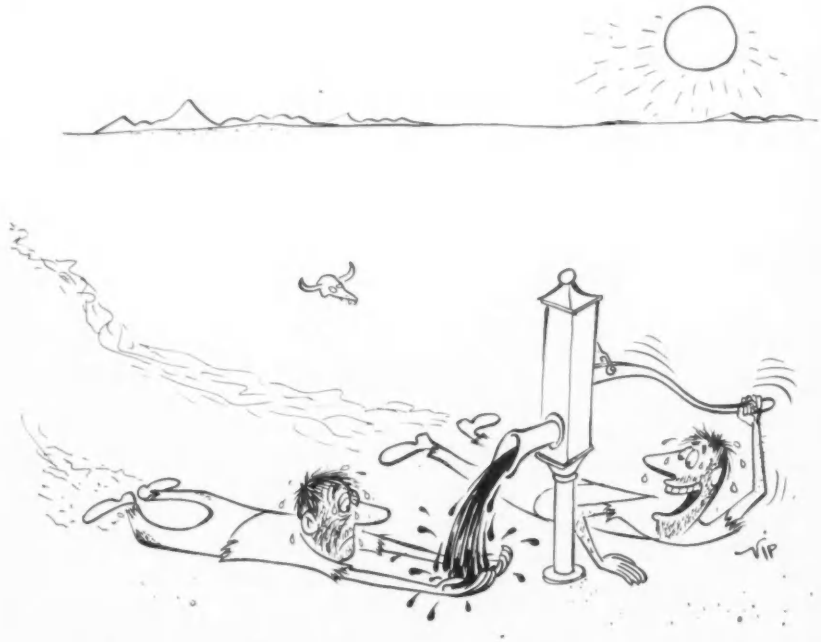
"This is the most wonderful marksmanship I have even seen," said the FBI man. "How in the world do you do it?"

"Easy as pie," was the reply. "I shoot first and draw the circles afterward."

•

Lucky People

You never realize how fortunate you are until you enter a gift shop and see how many things your friends haven't sent you.



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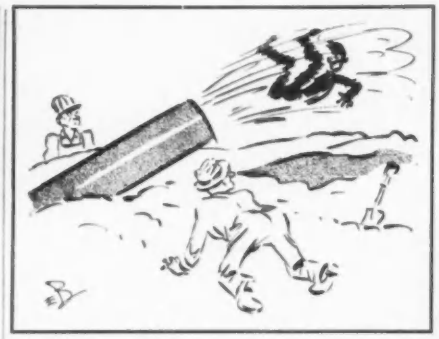

So that's where Kasper has been loafing!

The Doubting Thomas

The young man was on his way to Chicago via the air. He had to wait in the airport at Tulsa so he decided to check his weight. He dropped a penny in the weighing machine and out came a card saying: "You are John Brown. You are 19 years old and you are on your way to Chicago."

The young man was amazed so he decided to check the machine. He walked up and put in another penny. Out came another card saying: "You are John Brown. You are 19 and you are on your way to Chicago."

More amazed than ever he decided to make one more test of the machine. He put in another penny and stepped on the scales. Out came another card: "You are John Brown. You are 19 years old and you have horsed around so much you have missed your plane to Chicago."

•

This Modern Age

"Oh, little man, you mustn't cry," said the dear old lady when she saw a little boy stub his toe on the sidewalk and sprawl on his face.

"Cry, my eye," the boy retored, "I'm gonna sue hell outa somebody!"

•

Mistake

The treasurer, dictating letter: "From the comparative size of the pipe shipment and the bill, I should say you got them mixed—you should have sent the pipe by mail and the bill by freight."

•

Cost of Living

The Parkers were expecting a baby most any time and one night Mr. Parker frantically called the hospital for an ambulance. But they didn't quite make it in time. The baby was born on the front lawn of the hospital. Later the hospital sent Mr. Parker a bill, including the item: Delivery Room, $25.00.

It was Mr. Parker's first chance to chuckle over a hospital bill, so he grinned and wrote back that the baby was born on the hospital lawn, so how could they bill him for using the delivery room?

Back came another bill: Green Fees, $25.00.

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